Rayd R. Wile
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Circuit Court of the United States,

District of New Jersey.

AMERICAN GRAPHOPHONE COMPANY

vs.

NATIONAL PHONOGRAPH COMPANY.

In Equity. On Macdonald Patent No. 606,725.

RECORD.

PHILIP MAURO,
C. A. L. MASSIE,
Solicitors and of Counsel for Complainant.

FRANK L. DYER,
Solicitor and of Counsel for Defendant.

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In the Circuit Court of the United States for the District of New Jersey.

AMERICAN GRAPHOPHONE COMPANY *vs.* NATIONAL PHONOGRAPH COMPANY.	In Equity. On Macdonald Patent. No. 606,725.

Bill of Complaint.

(*Filed April 1, 1905.*)

To the Honorable the Judges of the Circuit Court of the United States for the District of New Jersey:

THE AMERICAN GRAPHOPHONE COMPANY, a corporation duly created and existing under and by virtue of the laws of West Virginia, and having its principal office at Bridgeport, Connecticut, brings this its bill of complaint against the NATIONAL PHONOGRAPH COMPANY, a New Jersey corporation having its principal office at West Orange, New Jersey,

And thereupon your orator complains and says:

1. That on November 27th, 1898, Thomas H. Macdonald, of Bridgeport, Conn., was the original, first and sole inventor of certain new and useful Improvements in the manufacture of Graphophone-Tablets, which improvements were not known or used by others in this country before his invention thereof, and were not patented or described in any printed publication in this or any foreign country before his invention thereof or before the date last-mentioned, and were not in public use or on sale in the United States for more than two years prior to said date, and which had not been adandoned.

2. That thereupon, on said November 27th, 1898, the said Macdonald made application in due form of law to the Commissioner of Patents for the grant of Letters-patent of the United States for his said invention, and then and there fully complied in all respects with the provisions and requirements of the laws of the United States, in such cases made and provided, no application for foreign patent thereon having then been filed.

3. That, the said application and the invention covered thereby having been duly assigned to your orator by the said Macdonald, and due proceedings being had upon said application, Letters-patent of the United States, in due form of law, were issued and delivered to your orator, in the name of the United States of

America, under the seal of the Patent Office and signed and countersigned, respectively, by the proper officers of the United States, numbered 606,725, and dated July 5th, 1898; and that the said Letters-patent did grant to your orator, its successors and assigns, for the term of seventeen years, from July 5th, 1898, the exclusive right to make, use, and vend the said invention throughout the United States and the territories thereof—as by reference to the said Letters-patent or a duly authenticated copy thereof, here in Court to be produced, will more fully and at large appear.

4. That your orator has been ever since the date of the assignment last mentioned, and is now, the sole and exclusive owner of the said Letters-patent and of all claims for infringement thereof; and has been and is, save for the doings of defendant and others acting in concert with it, in the exclusive possession of said rights and privileges and is entitled to the exclusive use, benefits and advantages of the said invention and improvements, and to sue for and recover to its own use and in its own name all claims for infringement or violation thereof; and that your orator has granted no license under said Letters-patent.

5. And your orator further shows that the invention set forth and claimed in and by the patent here in suit is of great value and importance, and your orator has expended large sums of money in developing the same and introducing the product thereof into public use; that your orator has created a large public demand for the said product which your orator is willing and able to supply; that your orator has been in the exclusive possession and enjoyment of the said invention and patent since the said assignment thereof; that the public at large has recognized and acquiesced in the value of the said invention and the validity of the said patent and your orator's title thereto; and that, but for the infringement and wrongs herein complained of, your orator would be in the peaceful possession and enjoyment of said Letters-patent and invention and of the income derivable therefrom.

6. And your orator further shows that your orator and all persons manufacturing under its authority have affixed to all articles made in accordance with the patent here in suit, the word "Patented" with the day and year of the grant thereof, and that this defendant has been notified by your orator of the infringement hereinafter complained of and requested to desist therefrom, but it has refused to do so.

7. And your orator has been informed and believes, and therefore avers, that this defendant within the said District of New

Jersey and elsewhere within the United States, before the verification of this bill and after your orator's acquirement of title to the said patent, and without your orator's consent, has infringed the said Letters-patent here in suit by making and using and selling, and by causing to be made and used and sold, graphophone-tablets (known as "Edison records" and "Edison blanks") constructed in accordance with the invention set forth and claimed in and by the said patent; that the said defendant has thereby greatly damaged your orator, that it has received large gains and profits by its said infringement, but to what extent your orator is ignorant and therefore prays a discovery; and that it is threatening to continue its aforesaid acts of infringement to a still greater extent and to your orator's irreparable damage and injury.

And forasmuch as your orator can have no relief save by this Honorable Court, your orator prays as follows:

1. That the defendant, its associates, attorneys, successors, assigns, servants, clerks, agents and workmen may be perpetually enjoined and restrained by writ of injunction, issuing out of and under the seal of this Honorable Court, from directly or indirectly using or causing to be used the invention and improvement set forth in the Letters-patent aforesaid, and from making or causing to be made, using or causing to be used, and selling or causing to be sold, any sound record or blank made in accordance with said invention.

2. That the defendant may be compelled by an order of this Honorable Court to deliver up to judicial custody for destruction, in manner to be provided in said order, all infringing sound-records or blanks in its possession or under its control.

3. That your Honors will grant unto your orator a preliminary injunction, to the same purport, tenor and effect as hereinbefore prayed for in regard to said perpetual injunction.

4. That the said defendant may be required by a decree of this Honorable Court to account for all such gains and profits as have accrued or arisen or been earned or received by it, and all such gains and profits as would have accrued to your orator but for its unlawful doings; and that the said defendant may be required to pay over to your orator in addition to the profits accounted for by defendant, three times the damages incurred by your orator by reason of the unlawful doings herein complained of.

5. That the defendant ma be decreed to pay the costs of this suit; and

6. That your orator may have such other and further relief as the equity of the case may require.

To the end, therefore, that the said defendant may, if it can, show why your orator should not have the relief hereby prayed, and may full, true and direct answer make—but not under oath, answer under oath being expressly waived—according to the best and utmost of its knowledge, information, remembrance and belief, to the several matters hereinbefore averred and set forth, as fully and particularly as if the same were repeated, paragraph by paragraph, and said defendant thereto severally and specifically interrogated—may it please your Honors to grant to your orator a writ of *subpœna ad respondendum*, issuing out of and under the seal of this Honorable Court, directed to said defendant, NATIONAL PHONOGRAPH COMPANY, commanding it to appear and make answer to this Bill of Complaint, and to perform and abide by such orders and decrees herein as to this Court may seem just.

And your orator will ever pray.

AMERICAN GRAPHOPHONE COMPANY,
[L. S.] by E. D. EASTON,
President.

Attest:
E. O. ROSMOND,
Sec'y.

PHILIP MAURO,
C. A. L. MASSIE,
Solicitors and of Counsel for Complainant,
277 Broadway, New York City.

STATE OF NEW YORK, }
County of New York, } *ss.:*

EDWARD D. EASTON, being duly sworn, deposes and says that he is president of the complainant company named in the foregoing bill; that he has read the same and knows the contents thereof; that the same is true of his own knowledge save as to the matters therein stated to be alleged upon information and belief, and that as to those matters he believes it to be true.

EDWARD D. EASTON.

Subscribed and sworn to before me, this 31st day of March, 1905.

ELISHA K. CAMP,
[L. S.] *Notary Public,*
New York County.

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In the Circuit Court of the United States for the District of New Jersey.

AMERICAN GRAPHOPHONE COMPANY *vs.* NATIONAL PHONOGRAPH COMPANY.	In Equity, No. 10. March Term, 1905.

Replication.

(Filed July 1, 1905.)

This repliant, saving and reserving to itself all and all manner of advantage of reception, which may be had and taken to the manifold errors, uncertainties, and insufficiencies of the Answer of the said defendant, for replication thereunto saith, that it doth and will aver, maintain, and prove its said bill to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the Answer of the said defendant is very uncertain, evasive, and insufficient in law to be replied unto by this replaint; without this, that any other matter or thing in the said Answer contained, material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true: all of which matters and things this replaint is ready to aver, maintain, and prove as this Honorable Court shall direct, and humbly prays as in and by its said bill it hath already prayed.

PHILIP MAURO,
C. A. L. MASSIE,
Solicitors for Complainant.

Dated July 3, 1905.

In the Circuit Court of the United States for the District of New Jersey.

American Graphophone Company *vs.* National Phonograph Company.	In Equity, No. 10. March Term, 1905. On Macdonald Patent, No. 606,725.

Complainant's Prima Facie Proofs.

(*Filed January 3, 1907.*)

Orange, N. J., July 26, 1905.

Complainant's prima facie proofs for final hearing taken under and pursuant to the 67th Rule of Equity and the practice of this Court, before Henry D. Oliphant, Esq., Standing Examiner, at the Edison Laboratory, Orange, N. J.

Met pursuant to agreement at 11:00 A. M.

Present—C. A. L. Massie, Esq., on behalf of complainant; Melville Chuerch, Esq., and Frank L. Dyer, Esq., on behalf of defendant.

Counsel for complainant offers in evidence printed Patent Office copy of Macdonald patent No. 606,725, granted to the American Graphophone Company, complainant herein, July 5th, 1898, on the application of Thomas H. Macdonald, and the same is marked in evidence "Complainant's Exhibits, Macdonald Patent in Suit." It is stipulated that the said Exhibit (subject upon notice to correction of errors, if any) may be used with like force and effect as the original patent; and this stipulation extends likewise to all U. S. Patent Office printed copies and to Blue-book copies of British patents.

It is stipulated that complainant owns the patent in suit.

It is further stipulated that if JONAS W. AYLESWORTH were called as a witness for complainant he would testify as follows:

Q. 1. Please state your name, age, residence, and occupation?

A. Jonas Walter Aylesworth; age, 36; residence, No. 223 Midland avenue, East Orange, N. J.; occupation, expert chemist connected with the National Phonograph Co., defendant herein, and the Edison Storage Battery Co.

Q. 2. I show you a copy of U. S. letters-patent No. 782,375, granted February 14, 1905, and ask you if you are the inventor named therein? *A.* Yes.

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Q. 3. Do you admit that since the grant of the Macdonald patent here in suit, and prior to the filing of the bill of complaint herein, the defendant, National Phonograph Co., has made sound records from the material described in the aforesaid Aylesworth patent, and that the said material was prepared in accordance with the description in the said Aylesworth patent; more specifically, as set out between line 27 of page 2 and line 30 of page 3 of said Aylesworth? *A.* Yes, I do.

> The Patent Office printed copy of Aylesworth patent No. 782,375 is offered in evidence as "Complainant's Exhibit, Defendant's Aylesworth Patent."

Q. 4. In preparing your alkaline solution in a steam-jacketed caldron (*circa* line 45 of page 2) is the temperature of the solution raised to about its boiling-point?

A. It may be raised to about its boiling-point. There is no need for keeping it at any particular temperature, but it naturally goes to its boiling-point owing to the reaction which takes place. There is heat generated in the reaction as it goes on. In order for the reaction to start it is necessary first to apply some heat, although the reaction would proceed in any event but it would take a much longer time.

Q. 5. When the alkaline solution has been added to the stearic acid, is there an excess of stearic acid or an excess of alkali; and about what proportion of unsaponified or free stearic acid, if any, remains?

A. There is an excess of stearic acid, there being only about one-half the quantity of alkali necessary to form a neutral compound.

Q. 6. After the carnauba wax has been added, and a temperature of about 450° F. has been maintained for about five hours, as stated in the second column of page 2, and when the ceresin has been added thereto, what temperature is then obtained?

A. The temperature is allowed to remain at the temperature it was when the ceresin was added for a short time, when it is allowed to cool off somewhat. The temperatures after that are not important, except to keep it at such a temperature that it will filter properly.

Q. 7. After the Aylesworth composition has been obtained, as described in "Complainant's Exhibit, Defendant's Aylesworth Patent," how were the sound-records made therefrom at a date prior to the filing of the bill of complaint herein?

A. In accordance with the patent granted to Miller & Aylesworth, No. 683,615, dated October 1st, 1901, and other patents relating thereto owned by the National Phonograph Co. and the New Jersey Patent Co.

The Patent Office printed copy of Miller & Aylesworth patent No. 683,615 is offered in evidence as "Complainant's Exhibit, Defendant's Miller & Aylesworth Patent."

Q. 8. Does not the addition of the ceresin serve to reduce the temperature somewhat? *A.* It does.

Q. 9. And to about what temperature would the mixture at 450° F. be reduced by the addition of the 21.36 pounds of ceresin? *A.* I should say about 20°.

Q. 10. And after the ceresin has been introduced, the mixture is then allowed to cool somewhat, as stated in your previous answer? *A.* Yes.

Q. 11. About how many degrees fall is there; that is, what do you mean by "somewhat"?

A. I must state that it is of no importance, and that we do not hold to any particular rule as to cooling after the wax is finished.

Upon request of complainant's counsel, it is stipulated by defendant that prior to the filing of the bill of complaint herein defendant was duly notified by letter of the acts herein complained of as infringements, and requested to desist therefrom; and that defendant has since continued the same acts.

Adjourned subject to notice.

In the Circuit Court of the United States for the District of New Jersey.

AMERICAN GRAPHOPHONE COMPANY
vs.
NATIONAL PHONOGRAPH COMPANY.

In Equity, No. 10.
March Term, 1905.
On Macdonald Patent,
No. 606,725.

Complainant's Prima Facie Proofs.

(*Filed January 12, 1907.*)

WASHINGTON, D. C., Oct. 25, 1905.

Testimony on behalf of complainant, taken in pursuance to agreement, before William B. Kerkam, Esq., Notary Public in and for the District of Columbia, acting herein as Special Examiner by consent, at the offices of Philip Mauro, Esq., No. 620 F. St., N. W., Washington, D. C., commencing at 10:00 A. M., Wednesday, October 25th, 1905.

Present—PHILIP MAURO, Esq., of Counsel for Complainant.

It is agreed that the direct examination of the witness may be proceeded with in the absence of counsel for defendant, right of objection and cross-examination being reserved to counsel for defendant.

And thereupon SHELTON T. CAMERON, being duly sworn, deposes and says in answer to interrogatories propounded by Mr. MAURO:

Q. 1. Please state your name, age, residence and occupation?

A. Shelton T. Cameron; 48 years of age; reside at Washington, D. C.; and by occupation lawyer, solicitor of patents, and mechanical expert.

Q. 2. Please state what experience you have had which would qualify you as an expert in causes relating to patents and particularly in patents relating to the art of recording and reproducing sound?

A. I was for more than eight years an assistant examiner in the U. S. Patent Office, where it was a part of my daily duty to examine and report upon applications for patents. Since severing my relations with the Patent Office I have been for more than nine years engaged in the practice of my profession, preparing and prosecuting a great number of applications for patents, rendering professional opinions on questions of patentability and infringement, and have testified a great many times in causes pending before the U. S. Courts, in which patents and patented structures were involved.

During the entire time which I have been engaged in private practice, I have been intimately familiar with the art of recording and reproducing sounds, having prosecuted a very large number of applications for patents in that art, and having testified a great many times as an expert in causes before the U. S. Courts involving patents in said art.

Q. 3. Have you read and do you understand the patent in suit granted to the complainant herein as the assignee of T. H. Macdonald, which patent is No. 606,725 and dated July 5, 1898?

A. I am thoroughly familiar with the patent referred to and have read and re-read it a number of times, and understand the invention described and claimed therein.

Q. 4. Have you read the deposition of Jonas Walter Aylesworth, the expert chemist connected with the defendant company, which deposition forms a part of complainant's prima facie proofs herein? *A.* I have.

Q. 5. Please describe briefly the subject-matter described and claimed by the patent in suit?

A. The subject-matter of the patent in suit as set forth in the descriptive matter and in the claims thereof is sound-recording material and the process of making or compounding said material, as well as the process of making a graphophone tablet composed of such material.

The specification of the patent in suit points out that prior to the date of the invention set forth therein certain inherent defects existed in graphophone tablets and the material of which they were composed. For example, the patent states that "the surfaces of such tablets become coated after a greater or less length of time with a bluish film having the appearance of mold and which has been termed efflorescence." It also states that this was due to the presence of hygroscopic compounds in the material which were attacked by moisture and thus caused to spread upon the surface of the tablet.

Another difficulty or defect lay in the formation of crystalline or crystallizable compounds which were formed in the operation of making the tablets previously employed, which tablets were largely composed of a metallic soap such as lime soaps or lead soaps. The patent points out that the real object of introducing the metal into the composition is to prevent the tendency to crystallization, since it is a matter of prime importance to obtain a composition which under all conditions shall remain perfectly amorphous. It furthermore points out that all ordinary commercial soaps possess the tendency to crystallization in some degree.

In carrying out the invention the applicant takes stearic acid and converts it into soda soap, and particularly emphasizes the fact that the stearic acid should differ from that used in making ordinary soda soap in that certain impurities, such as oleic acid and glycerine, should be entirely eliminated, as otherwise unsatisfactory results would be obtained. The patent further points out that all of the stearic acid employed is not saponified, the amount of caustic alkali employed being only sufficient to partially saponify the mass of stearic acid. The preferred degree of saponification is that in which sufficient caustic alkali is employed to saponify about two-fifths of the stearic acid present, but the patentee points out that while this proportion gives the best result, the proportions may nevertheless be varied within suitable limits. The greater the amount of alkali, according to a statement made in the patent, the higher would be the melting point of the soap, and the patent states that as the material is to molded into suitable form it should be capable of melting at a moderate temperature of from 250–330° F.

Into this soap of about two-fifths saponification there is also incorporated a small amount of aluminium which is employed either in the form of aluminic hydrate or in the metallic state, either powdered or in small ingots. The patent points out that the method of introducing the metal into the mixture is a matter of importance, owing to the tendency of sodium and aluminum, when combined, to form crystallizable compounds. Preferably the patentee first adds the aluminium to the soda lye, thereby forming with a portion of said lye aluminate of soda, which the patent states readily unites with the stearic acid when the two are brought together.

One specific formula given as illustrating the invention is as follows:

(1) stearic acid free from oelic acid and glycerine, 408 pounds;
(2) aluminic hydrate, 7 pounds;
(3) caustic soda lye, 85 pounds;
(4) tempering material, as paraffin or ozokerite, 72 pounds.

In the process of manufacture, the caustic soda is incorporated with enough water to make a lye of 37.5° B., and then is heated to its boiling point—about 242° F. The aluminic hydrate is added to this lye by which it is quickly taken up.

Stearic acid is melted and raised to about 242° F. after which the compound of lye and aluminium is slowly added thereto.

The patent points out that a temperature of about 242° F. is preferred, since at this temperature the formation of the composition proceeds gradually and without violent ebullition. After the lye with the aluminic hydrate dissolved therein is added to the melted stearic acid, the patent states that the temperature may be raised to about 300 degrees F. and continued at that temperature until all the water is expelled, after which the tempering material, such as paraffin, ozokerite or ceresin (which latter is but a refined form of ozokerite) is added to bring the mixture to the desired degree hardness.

Instead of the formula above given, the following formula may be employed:

(1) stearic acid, 300 pounds;
(2) powdered aluminium, 1.5 pounds;
(3) caustic soda lye, 37.5 degree B., 9 pounds;
(4) sal soda to be dissolved in 12 gallons of water, 60 pounds;
(5) ceresin, 60 pounds.

The patentee states that in this formula the aluminium may be either added to the caustic soda before mixing it with the sal soda lye, or after mixing the sal soda lye and caustic soda lye. He further states that instead of powdered aluminium he may use ordinary ingot aluminium with results nearly if not equally as good.

The material having thus been formed is molded to the desired form after which it is quickly cooled to the ordinary temperatures.

Q. 6. I call your attention to U. S. patent No. 782,375, granted Feb. 14th, 1905. Please state if you are familiar with said patent, and if you have read and understand the same?

A. I have carefully read the patent referred to and understand the invention described and claimed therein.

Q. 7. Please compare the process set forth in said patent with that described in the patent in suit, and defined in the claims thereof, and state whether or not, in your opinion, the defendant herein in practicing the process set forth in said patent No. 782,375, practices the process and manufactures the composition of matter described in the patent in suit, and defined in the claims thereof. In answering this question, you may refer to the deposition of Jonas Walter Aylesworth, the alleged inventor of the process defined in said patent No. 782,375.

A. The patent No. 782,375 states, page 1, lines 9–12, that

> "My invention relates to a new composition adapted particularly for making duplicate phonograph records obtained by any suitable process from a matrix or mold.."

The specification sets forth a long list of desirable characteristics which it is alleged that compositions suitable for the purpose in view should possess, among which I note, page 1, lines 83, 84

> "It should not be affected by moisture, so as to be preserved in damp climates."

And in lines 92, page 1, to line 5, page 2, the specification states:

> "It should be perfectly amorphous and non-crystalline, since the latter materials harden very quickly at the surface when their congealing temperatures are reached and shrink irregularly, with the objections pointed out."

The composition itself, as set forth in the claims and in the body of the specification as well as in the figure of the drawing accompanying the specification, consists of stearate of soda, stearate of alumina, carnauba wax, ceresin and lamp black.

In practicing the process, the patentee states that he employs stearic acid which is well known to consist generally of a mixture of stearic and palmitic acids, and, like the stearic acid employed in the process of the patent in suit, he takes care to employ stearic acid free from oleic acid and glycerine, as well as other impurities named, such as mineral acids, salts and undecomposed fats; *i. e.,* he employs what is ordinarily known as a pure stearic acid, although, strictly speaking, like all pure commercial stearic acid, it consists of a mixture of stearic and palmitic acids.

One hundred pounds of commercial stearic acid free from the impurities noted above is melted in a vessel at a temperature of 240 degrees F.

There is then prepared a solution of carbonate of soda and aluminate of soda by dissolving 21.5 pounds of re-crystallized sodium carbonate in water, and adding to the solution 452 grams of caustic soda.

When the caustic soda is entirely dissolved, there is then added 175 grams of metallic aluminium, and after the aluminium has been dissolved in the lye the same is added to the stearic acid while the temperature of the mixture is gradually raised to correspond with the increased melting point of the mixture, which, at the end of the operation, the patent states will eventually run up to 360 degrees F.

This results in a metallic soap composition possessing a large amount of free stearic acid, by reason of the fact that not enough alkaline solution was employed to saponify the amount of stearic acid used. Thus, the patentee states that for certain purposes he adds a very hard wax, such as carnauba wax, and that certain alleged alcohols of the carnauba wax combine with "the excessive stearic acid present in the metallic soap composition" (page 2, line 97, 98).

After the addition of the carnauba wax to the partially saponified stearic acid containing the aluminium, the patentee states that he adds 21.36 pounds of ceresin thereto, although other hydrocarbon waxes, such as paraffin or ozokerite might be employed (page 2, lines 115–118). The object of the ceresin or equivalent waxes is to make the mixture non-hygroscopic and less brittle than it would otherwise be, *i. e.,* to "temper" it.

After the ceresin is added and thoroughly incorporated with the mixture, the congealing temperature of such mixture is regulated by adding free stearic acid thereto. The temperature preferred in practicing a certain process mentioned (Miller & Aylsworth patent No. 683,615) being about 290 degrees F.

Comparing the process of the patent in suit and that described in the patent No. 782,375, and paralleling the formulas given, we have the following:

Macdonald Patent in Suit.	*Aylsworth Patent No. 782,375.*
(1) stearic acid, 300 pounds;	(1) stearic acid, 100 pounds;
(2) caustic soda, 9 pounds;	(2) caustic soda, 452 gr. 1 lb.
(3) sal soda, 60 pounds;	(3) sal soda (sodium carbonate) 21.5 pounds;
(4) aluminium, 1.5 pounds;	(4) aluminium, 175 gr. equals .385 pounds;
(5) ceresin.	(5) ceresin;
	(6) carnauba wax.

The patent in suit adds a sufficient quantity of ceresin to bring the mixture "to the desired degree of hardness." The Aylsworth patent states that 21.26 pounds of ceresin are added "to make the mixture non-hygroscopic and less brittle than it would otherwise be," *i. e.*, to "*temper*" it.

In the treatment of the stearic acid, according to the patent in suit and according to the Aylsworth patent, it is melted and raised to a temperature of about 242 degrees F. in each case; the patent in suit stating that "the stearic acid is melted and raised to about the same temperature" as the boiling point of lye, which is said to be about 242 degrees F. (see lines 41–49, page 2).

The Aylsworth patent states that the stearic acid is melted in a vessel at a temperature of about 240 degrees F.

In each the alkaline solution is brought to the boiling point. This is expressly stated in the patent in suit to be about 242 degrees F. The fact that under the Aylsworth patent the lye is brought to the boiling point does not appear in the specification of the patent itself, but it does appear from the answer of Mr. Aylsworth to Q. 4 of his deposition.

The patent in suit states that the aluminium may be added to the alkaline solution after the sal soda lye and the caustic soda lye have been united (lines 64–66, page 2), and the Aylsworth patent expressly states (lines 40–49, page 2), that he forms a solution of sodium carbonate and caustic soda, and then adds the metallic aluminium thereto.

After the addition of the alkaline solution containing in the aluminium to the stearic acid, the patent in suit states that the temperature may be raised to about 300 degrees F. and continued at that heat until the water is all expelled (lines 53–56, page 2).

The Aylsworth patent states that the temperature is gradually raised and that it will run up to about 360 degrees F. (lines 75–77, page 2).

Down to this point the process set forth in each patent employs the same pure stearic acid heated to the same degree; each then partially saponifies the stearic acid by an alkaline solution containing aluminium dissolved therein, which solution has been heated to the same degree in each case; and in each the temperature is raised after the addition of the alkaline solution, resulting in the expelling of water. In the practice of each process there is added to the composition thus obtained a tempering wax, each patent mentioning paraffin, ozokerite or ceresin as the tempering wax employed.

The patent in suit states that the temperature may be raised to about 300 degrees F. and that "after the material is molded to the desired form it should be quickly cooled to the ordinary temperature," from which I understand that the material is poured into the mold at a temperature of about 300 degrees F.

The Aylsworth patent states that he regulates the congealing temperature by adding free stearic acid until such temperature is at about 290 degrees F.

It appears therefore that the process described in the patent in suit and that set forth in the Aylsworth patent inquired about are identical with the exception of the fact that Aylsworth adds carnauba wax to his composition and heats the latter up to about 450 degrees F. for the purpose of bringing about an alleged combination between the alcohols of the carnauba wax and free stearic acid found in the metallic soap composition.

I therefore find that in practicing the process described in the Aylsworth patent No. 782,375, the process described in the patent in suit is practiced even down to the minutia of almost the exact temperatures employed.

Referring now to the claims of the patent in suit, and comparing them with the process described in patent No. 782,375, in the light of Mr. Aylsworth's deposition, I find that there is made by such process a composition of matter defined in claim 10 of the patent in suit, and that there is practiced the process set forth in each of the other claims of the patent in suit, except possibly claim 4.

The first claim of the patent in suit is as follows:

> "1. The process of making a sound recording material, by dissolving aluminium in soda lye, and adding the solution to stearic acid, substantially as described."

The composition of the Aylsworth patent No. 782,375 is a sound recording material, and in making the same there is dissolved aluminium in soda lye which solution is added to stearic acid, and it is very clear therefor that the process of claim 1 is practiced.

Claim 2 differs from claim 1 in that it requires that the stearic acid shall be free from glycerine and oleates, and that the compound shall be heated, and the Aylsworth patent expressly states that

> "Care should be taken to see that the stearic acid is free from oleic acid as well as from mineral acids, salts, glycerine, and undecomposed fats, as tallow, etc."

Moreover, the patent expressly states that the whole mass is heated. It is therefore clear that the process of this claim is practiced.

Claim 3 calls for the addition to the stearic acid, of soda lye with aluminium united thereto, the soda lye being used in such quantity as to produce partial saponification, and then heating the mixture. As clearly appears (lines 94-101, page 2 of the Aylsworth patent) there is free stearic acid in admixture after the soda lye and aluminium has been added thereto, and it is therefore plain that there has only been sufficient soda lye added to the stearic acid to produce "partial saponification," as required by claim 3.

Claim 4 requires specifically that there shall be soda lye added to the stearic acid "sufficient to produce about a 40% saponification," and the patent states that this proportion is "variable within limits." Furthermore, Mr. Aylsworth's deposition admits (*Q*. 5) that only about 50% of the stearic acid employed by defendant is saponified, and therefore I find that the process of this claim is practiced.

Claim 5 requires that the soda lye with the aluminium therein and the stearic acid should be both heated to about the boiling point of the lye, after which the lye and aluminium are added to the stearic acid and the heating continued until the moisture is expelled. Under the process of the Aylsworth patent, the stearic acid and the soda lye solution with the aluminium dissolved therein are each heated to about the boiling point of the lye, and the heating is continued, the patent stating (lines 73–75, page 2):

> "During the saponification which thus takes place, water is driven off."

I find therefore that the process defined in claim 5 is practiced.

Claim 6 is substantially the same as claim 5 except that the step

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of molding the material and cooling the same is added. I find from the Aylsworth patent that it is expressly designed for the manufacture of phonograph records by a molding process and from Mr. Aylsworth's deposition I learn that sound records were made therefrom in accordance with the patent granted to Miller & Aylesworth, No. 683,615. This patent sets forth a process of molding records, and that after the molten material has been placed in the mold and partially hardened, said mold is placed in a chuck, which is provided with a water jacket through which cold water may circulate, and this would necessarily result in the quick chilling or cooling of the record as demanded by claim 6 of the patent in suit.

Adjourned to 10:00 A. M., Thursday, Oct. 26, 1905.

WASHINGTON, D. C., Oct. 26, 1905.

Met pursuant to adjournment.

Parties present as before.

(Mr. Cameron continues his answer to *Q.* 7):

Claim 7 defines the process of making a sound recording material by partial saponification of stearic acid with soda lye having aluminium united therewith. As defendant unites aluminium with soda lye and then only uses enough of said lye to partially saponify the stearic acid employed, it is clear that the process of claim 7 is practiced.

In claim 8 it is required that "aluminic hydrate" shall be added to caustic soda lye which compound is then added to melted stearic acid and the resulting mixture heated. The defendant adds aluminium rather than aluminic hydrate to caustic soda lye, and then adds this compound to melted stearic acid, and heats the mixture. The step pursued by the defendant differs from that defined in the claim only in that metallic aluminium is employed where the claim requires "aluminic hydrate." I observe, however, that in the two formulas given in the patent in suit aluminic hydrate is employed in one whereas aluminium is employed in the other, and I understand that the ultimate result is the same, both the aluminic hydrate and the aluminium when dissolved in caustic soda lye resulting in the production of aluminate of soda. Inasmuch therefore as the patent indicates that it is a matter of choice whether aluminic hydrate or aluminium is employed; and inasmuch as the evident result is the same whichever form of the metal is employed, I regard the aluminic hydrate and the aluminium as full equivalents, and am therefore of the opinion that the process defined in claim 8 is practiced by the defendant.

In claim 9 the steps defined involve adding aluminium to soda lye, then adding this lye with the aluminium therein to stearic acid, heating the mixture and adding a softening material, such as paraffin. In the process practiced by the defendant, each of these steps is performed in the order named, the defendant, however, using ceresin as the softening material rather than paraffin. This is immaterial in my opinion since it is specifically stated in the Aylsworth patent, No. 782,375, that paraffin may be substituted for ceresin. Moreover, the claim under consideration is not limited to the employment of paraffin but to the employment of a softening material of which paraffin is an illustration. It is therefore clear that the process of claim 9 is practiced by the defendant.

Claim 10 is for a composition of matter for a sound-recording tablet formed of pure stearic acid, *i. e.*, stearic acid which is free from oleic acid and glycerine, which stearic acid is partially saponified by caustic soda, the latter having aluminium incorporated therein. Since the defendant follows the process set out in the Aylsworth patent, No. 782,375, which expressly indicates that the stearic acid employed is one that is to be free from oleic acid and glycerine and therefore "pure" in the sense in which this word is used in claim 10; and inasmuch as the stearic acid employed is partially and only partially saponified by caustic soda which has aluminium incorporated therein, it is clear that the defendant makes the composition of matter defined by claim 10, and that said composition of matter is made for the purpose of using the same as a sound-recording tablet.

Claim 11 defines the process of making a sound-recording material by adding aluminate of soda to stearic acid and heating the mixture. The aluminate of soda is obtained by dissolving aluminium in caustic soda lye and as the defendant not only dissolves aluminium in the soda lye but adds the same to stearic acid and heats the mixture, it is clear that the process of claim 11 is practiced by the defendant.

Direct examination closed.

Adjourned to Wednesday, November 8, 1905, at 10:00 A. M.

WASHINGTON, D. C., Nov. 8, 1905.

Met pursuant to adjournment.

Present—REEVE LEWIS, ESQ., representing Philip Mauro, Esq., for complainant; FRANK L. DYER, ESQ., for defendant.

(Mr. Dyer proceeds with the cross-examination of Mr. Cameron):

xQ. 8. Did you prosecute the application for the patent in suit?

A. I was not the attorney of record, and I cannot say whether or not I had anything to do with the prosecution, from memory. I think that at the time the patent was taken out I was doing considerable work for Mr. Mauro in the prosecution of applications, and may have done something in this case.

xQ. 9. How long have you been practically familiar with the talking machine art? *A.* Since 1896.

xQ. 10. What part of 1896?

A. The Fall of 1896, as I remember.

xQ. 11. Can you state whether or not at that time cylindrical talking machine records embodied the composition of the patent in suit? *A.* So far as I know, it did not.

xQ. 12. What was the character of talking machine records in the Fall of 1896?

A. You mean the character of the material employed for the tablets?

xQ. 13. Yes; in physical properties. That is to say as to the character of their surface, their hardness, the smoothness with which they could be cut, and their permanent character?

A. The material employed at that time could be readily cut and to a fair degree possessed the properties of smoothness, and were more or less permanent. That is, the material employed while fairly smooth was open to certain defects which interfered with the cutting but at the same time enabled a tolerably good record to be made. The same difficulties which interfered with the perfection of the cutting also interfered with the smoothness of the cut or finished record, and while, as I stated above, such records were fairly permanent, they nevertheless yielded under the wearing operation of reproduction to a much greater extent than is the case with records of the present day. Sometimes a record would wear out after from twenty-five to forty reproductions, and particularly was this the case when such record was employed as a master record for actuating duplicating machines. Other records would sometimes stand a much greater number of reproduction. This would vary with the particular machine employed in the reproduction, with the temperature at which the reproduction was effected, etc.

xQ. 14. When you speak of "records of the present day," you refer to the molded records made by complainant and defendant herein, do you not? *A*. I do.

xQ. 15. In *xQ*. 13 you state that the material used in the Fall of 1896 "was open to certain defects which interfered with the cutting." What were these defects?

A. The material was not always perfectly amorphous, and there was liable to be present in the composition foreign bodies which would resist the cutting action of the style and cause it to tear or drag out the material instead of effecting a clean cut. Another difficulty was the fact that it was difficult to avoid the presence of crystalline formations which were objectionable because the material would cleave or separate along the lines of cleavage of the crystals rather than along the line corresponding perfectly to the sound wave, and while these defects were very minute, nevertheless in an art of this character, where variations of the thousandth part of an inch is a matter of importance, they contributed more or less to the imperfection of the record cut by the recording style.

xQ. 16. What resulted in the presence of the "foreign bodies," referred to in your last answer, and what were they?

A. As to what resulted in their presence it would be difficult to state. The foreign bodies I had specially in mind were fibrous material such as dust floating in the air. These fibres when they were present in the material would be torn rather than cut by the recording style and would produce the roughness or irregularities to which I have referred.

Q. 17. Does the patent in suit indicate any way by which the foreign bodies you have referred to can be eliminated, or their presence avoided? *A*. No.

xQ. 18. So far as your acquaintance with this art in the Fall of 1896 goes, as I understand you, the principal defect in talking machine records at that time was that the compositions were not perfectly amorphous but were more or less crystalline. Is this correct?

A. The defects which interfered with the cutting of the record were that the material was more or less crystalline and was also liable to have present in the composition the foreign bodies to which I have referred. There were, however, other defects in the composition besides those which interfered with the cutting. One of the chief difficulties, so far as the practical use of the material was concerned, lay in the fact that the material would "mold," as it was ordinarily called, *i. e.*, there would form upon the surface of the material a film technically known as "efflorescence." The patent in suit very clearly expresses this, lines 48–53, page 1, as follows:

> "The chief difficulty has been that the surfaces of such tablets become coated after a greater or less length of time with a blue film having the appearance of mold which has been termed 'efflorescence'."

I have seen records so completely covered with this mold or efflorescence as to fill the record groove with a fine, minute substance which when brushed off with a handkerchief would fall in a shower from the record.

xQ. 19. Am I right in saying that in the Fall of 1896, when you first became familiar with this art, the talking machine records then in use were characterized in the respects, first, that they contained foreign matter, such as particles of dust, etc.; second, that they were crystalline, so as to prevent the formation of a perfect record; and, third, that their surfaces would mold or effloresce?

A. Prior to the date of the invention of the patent in suit, the objections to which you refer existed. As to just when the complainant, for example, began to use material of the character described in the patent in suit, I cannot state. Possibly it did this prior to the Fall of 1896. I know, however, that the defects referred to in your question were present in records which were on the market as late as the Fall of 1896, and I at this date have in my possession records in which these defects are present, particularly that of the mold or efflorescence due to the exposure of the records to moisture.

xQ. 20. In the previous answer do you speak of your own knowledge?

A, I cannot state of my own knowledge as to when the invention of the patent in suit was made, but prior to the Fall of 1896 records were made in which the defects mentioned were present.

xQ. 21. Are you able to state whether or not, prior to the Fall of 1896, the Edison records, made by defendant were open to the objections to which you refer? *A.* I am not.

xQ. 22. The patent in suit refers to the fact that lead had been proposed as an ingredient in the sound record composition. Is it your understanding that the defective records which existed in the Fall of 1896 employed lead in their composition?

A. As to what was actually employed, I am without personal knowledge. I understand, however, that this had been proposed and it has always been my impression that lead was actually employed.

xQ. 23. Are you familiar with the fact that in the Fall of 1896 the talking machine art had been developing for six or seven years, that many thousand phonographs and graphophones were on the market, and that hundreds of thousands of phonograph and graphophone blanks had been made and sold?

A. As a matter of general history of the art I know this to be true. And I also know that while the machines and the records of that date constituted a very material advance and improvement over what had existed say prior to 1888 to 1890, nevertheless, when compared with the machines and records of to-day, they were of a very inferior order, so inferior indeed that at the present day they could not be sold in competition with the modern products.

xQ. 24. It is not necessary for us to consider what is being done to-day, because we are dealing with a patent the application of which was filed in 1896. I understand, however, that you are of the belief that Edison blanks, for example, as made from 1890 to the date of the application of the patent in suit and subsequent thereto, and publicly and continuously sold in this country during that time, were characterized by the objections to which you have referred, and particularly the non-amorphous character of the composition and the production of mold or efflorescence on its surface?

A. Without having personal knowledge as to the so-called Edison records, prior to 1896, it has been my impression that these records in common with those of the complainant were possessed of the defects mentioned.

xQ. 25. And your deposition in this case has been given with this understanding?

A. So far as I am aware this understanding had nothing whatever to do with my deposition given in this case. My deposition given in this case was purely for the purpose of explaining the objects of the invention described and claimed in the patent in suit, and the particular invention itself with a view of placing plainly before the Court just what the process and the composition of matter constituting the invention, really were.

xQ. 26. As I understand it, you have accepted as correct, the statement of the prior art as set forth in the patent in suit?

A. I did. I did not undertake to go into the prior art in my deposition.

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xQ. 27. Is it not a fact that commercial stearic acid is always found admixed with a considerable proportion of palmitic acid?

A. The authorities are all agreed that such is the case.

xQ. 28. When the patent in suit refers to "stearic acid as nearly pure as can be obtained" (page 1, lines 82-83) do you understand that the patentee intended to eliminate palmitic acid?

A. No, sir. As stated in your previous question, so-called pure stearic acid as it commercially appears, is composed of, according to the authorities, stearic and palmitic acids, and when there are no other bodies present than the stearic and palmitic acid, it is ordinarily spoken of as pure stearic acid. If you send an order, for example, for stearic acid, you will always get the stearic acid with the palmitic acid present.

The patent, however, makes it perfectly clear as to what is meant by "pure" stearic acid. There are certain impurities sometimes present in stearic acid whose properties differ materially from that of either stearic or palmitic acid; for example, oleic acid and glycerine, and even particles of undecomposed tallow will sometimes be found to be present. The stearic and palmitic acids are so nearly alike in their characteristics, as I understand from the authorities (not being myself a chemist), that they may be treated as one substance and pass under the name of stearic acid. On the other hand, oleic acid and glycerine, if present in the material of the sound record, have been found objectionable, and the patent in suit in formula A, beginning in line 35, page 2, states that the stearic acid employed, is "free from oleic acid and glycerine." Furthermore, in claim 10 of the patent in suit, there is given an express definition as to what is meant by "pure stearic acid," the patentee stating that this is "free from oleic acid and glycerine."

I therefore understand the expression "pure stearic acid" to mean the stearic acid composed, as stearic acid commonly is, of stearic acid and palmitic acid, but without the presence of oleic acid, glycerine and like objectionable bodies.

xQ. 29. Do you regard stearic acid and palmitic acid as equivalents in this art?

A. Without a more thorough chemical knowledge than I possess, I should hesitate to state that they were, under all conditions in this art, full equivalents. My understanding, however, is that practically stearic acid with palmitic acid present in it may be treated as if no palmitic acid was present. The melting point, boiling point, and many of the other physical characteristics of the two acids are very nearly the same.

xQ. 30. Is it your understanding that stearic acid alone, without palmitic acid, can be effectively used in this art?

A. I know of no reason why it cannot be, but as chemically pure stearic acid is very expensive, and as the palmitic acid present in the stearic acid does not affect the stearic acid does not affect the stearic acid for practical purposes; and as the stearic acid with the palmitic acid in it is the cheapest form in which to get stearic acid that is suitable for practical use in the art, it is the one which is universally employed.

xQ. 31. Can you tell me how long before the application of the patent in suit it was possible to purchase in the open market pure stearic acid free from oleic acid and glycerine?

A. I cannot. I never purchased stearic acid in the open market.

xQ. 32. Is it your understanding that Mr. Macdonald was the first to observe the necessity of employing stearic acid free from oleic acid and glycerine in this art?

A. I am without information as to whether he was or not.

xQ. 33. What is the purpose of employing aluminum hydrate or metallic aluminum in the composition of the patent in suit?

A. As I understand the patent in suit, the object of introducing any metal into the soap composition is to avoid the tendency to crystallization. Some metals, however, are not capable of being introduced into the composition in sufficient quantity to overcome this tendency to crystallization entirely without other injurious results. I understand that the object of introducing the aluminium is the same as that of introducing the lead, previously suggested, aluminium being employed because it gives the desirable features due to the presence of the lead in a more perfect degree, or without the presence of the objectionable features.

xQ. 34. And as you understand it, when lead was used, although the tendency to crystallization was overcome, the objectionable tendency to effloresce was manifested?

A. Yes; and particularly if lead was employed in the presence of oleic acid so as to form oleate of lead. The patent states that:

> "I have found that lead in any form, as well as most of the salts of other metals which might be otherwise suitable for the purpose in view, give rise to hygroscopic compounds. This is particularly true of stearates and acetates of lead."

xQ. 35. Where does the patent point out the particular objection to oleate of lead, referred to in your last answer?

A. In lines 43–46, page 1, the patent states that:

> "Tablets made of insoluble lime soap or of stearates or oleates of lead have never yielded commercially successful results."

The particular objection, or the particular reasons why the oleates of lead have not yielded successful results, are not specified. In my previous answer where I said oleates of lead I should have said acetates of lead. The patent states, however, that the patentee has found that the presence of even a small quantity of oleates or oleic acid is detrimental, and the presence of oleic acid in the composition would, as I am informed, result in the formation of oleate of lead if lead were employed in the composition.

xQ. 36. Do I understand you to say that the presence of oleic acid is not objectionable when aluminium is employed?

A. Oh, no. I have not so stated. I understand that the presence of oleic acid is objectionable even if aluminium is employed.

xQ. 37. Do you regard aluminium hydrate and metallic aluminium as equivalents in this art?

A. I must again disclaim any particular qualifications as a chemist. I understand, however, that the results of employing either aluminium hydrate, mentioned in formula "A" of the patent in suit, or aluminium, as mentioned in formula "B" of the patent in suit, are the same. That is, in each case, the result of the reaction of the soda lye with either form of the aluminium, produces aluminate of soda.

xQ. 38. Do I understand from this that you do or do not regard the two as equivalents? *A.* I do so regard them.

xQ. 39. And would you regard as the equivalent any other salt of aluminium which when added to the soda lye will form aluminate of soda? *A.* As to that I could not state.

xQ. 40. In claims 1, 2, 3, 5, 6, 7, 9 and 10, reference is made to "aluminium"; and in claims 4 reference is made to "a metal." Is it your understanding that these particular claims cover only the use of metallic aluminium?

A. No, sir. The patentee states, lines 17-22, page 2:

> "In this soap I have incorporated aluminium, which I have found to be the metal best suited in all respects for the purpose. This may be used in the form of aluminic hydrate or in the metallic state, powdered or in the metallic state, powdered or in small ingots."

By this I understand that "aluminium" as used in the claims referred to in your question means that metal either in the form of aluminic hydrate or in the metallic state.

As to the term "metal" in claim 4, I understand that it refers to the employment of a metal whether that metal be aluminium or not.

xQ. 41. Well then, as I understand you, the fourth claim would cover a composition employing lead?

A. The fourth claim defines a process which if the other steps of the process defined in the claim were used and lead was employed as the metal, would be practiced. The essential feature of the process of claim 4 is that a soda lye containing any metal should be employed in treating stearic acid, the lye however being only in a quantity sufficient to produce about a 40% saponification.

xQ. 42. If the word "aluminium" in most of the claims means either aluminium or aluminic hydrate, am I correct in assuming that the expression "aluminic hydrate" in the eighth claim means either aluminic hydrate or aluminium?

A. I should interpret claim 8 as meaning just what it says: "aluminic hydrate." I should regard, however, any process which was the same as that defined in claim 8 except that it substituted for the aluminic hydrate an equivalent thereof as being in substance the process defined in claim 8.

xQ. 43. Why, in construing the eighth claim, do you state that it means just what it says, while in construing the other claims to which I have called your attention you state that they mean something more than they say?

A. Because the patent in the lines which I have previously quoted expressly states what is meant by "aluminium"; *i. e.*, the patent says that this aluminium may be either in the form of aluminic hydrate or in the metallic state. Therefore, when the patent says aluminium, I read it as if it were a generic term including both of these as well as any other form of aluminium which may be found by experts to be their equivalent.

I have heretofore pointed out that the result of employing metallic aluminium or the aluminic hydrate, as stated in the patent, is the formation of aluminate of soda when the soda lye is added. As I understand the doctrine of equivalents in patent law, even though claim 8 specifically calls for the use of aluminic hydrate, any other form of aluminium which would give an equivalent result in the process would not materially change the process and would not therefore constitute a departure from the process defined in the claim.

xQ. 44. And would you regard as an equivalent any other metallic *hydrate*, the use of which secured equivalent results?

A. No, I regard the patent as limited to the employment of aluminium in some form.

Referring to your previous question, I note that in lines 46-49, page 2, the patent states that the compound composed of aluminic hydrate and caustic soda lye is a "compound of lye and aluminium," which is, to my mind, further evidence that when aluminic hydrate is employed it is to be treated as the full equivalent of the metallic aluminium.

xQ. 45. Is it your understanding that if metallic aluminium is added to soda lye the resulting compound is aluminic hydrate?

A. No, sir. My understanding is that if metallic aluminium is added to soda lye there would be formed aluminate of soda. Whether you could call the "resulting compound" aluminate of soda would, as I understand it, depend upon the proportions of the two ingredients. If a very small quantity of the metallic aluminium were added to a large quantity of soda lye, I understand that there would result a soda lye with a small quantity of aluminate of soda therein. That is, the reaction between the lye and the aluminium would produce aluminate of soda so far as the aluminium went, leaving a large quantity of free soda lye uncombined with aluminium.

xQ. 46. If you now regard the patent in suit "as limited to the employment of aluminium in some form," then the fourth claim would not be broad enough to cover a process using lead, as I understand you?

A. I have already made it perfectly clear that I regard claim 4 as being broad enough to include lead or any other metal. This claim does not specify aluminium in any form.

xQ. 47. I call your attention to your answer to *xQ*. 44, and I assumed that you do not then regard the claim as limited to the employment of aluminium in some form. Which answer am I to accept as embodying your views of the patent in suit?

A. If my answer to *xQ*. 44 is read in connection with my previous answers, there will be no difficulty in understanding my interpretation of the patent. Perhaps I was not strictly accurate in stating that "the patent" is limited to aluminium. More accurately stated the claims of the patent which specify either aluminium or aluminic hydrate are regarded as limited to aluminium in some form. I had already stated so clearly that there could be no misunderstanding that claim 4 was not limited to the use of any particular metal.

xQ. 48. The patent in suit states that the addition of the caustic solution to the melted stearic acid is effected at a temperature of about 242 degrees F. (page 2, lines 41-53) and that the "temperature may subsequently be raised to about 300 degrees F. and continued at that heat until the water is all expelled" (page 2, lines 53-56). What is your understanding of the necessity for thus increasing the temperature?

A. The patent is silent as to the object of increasing the temperature except the statement contained in the lines quoted that the temperature is "continued at that heat until the water is all expelled," and the further statement found in the claims that the heating is continued "until the moisture is expelled." From this I woud understand that the object of continuing the heating is to expell moisture from the composition.

xQ. 49. Is it your understanding that the moisture would not be expelled at a temperature of 242 degrees F.?

A. Two hundred and forty-two degrees F. is stated to be the boiling point of the lye, and at the boiling point I should presume that moisture would be expelled. Whether the addition of the aluminium to the lye would change this or not I am unable to state. I observe, however, that the patent states that the temperature *may* be raised to about 300 degrees F. From this I would infer that it is not essential but that by raising the temperature to this point the expulsion of the water could be more effectively accomplished or could be more rapidly accomplished.

xQ. 50. Would it be a fair understanding of the patent in suit to say that while the patentee prefers to raise the temperature to 300 degrees, it was not necessary to do so. The temperature might be maintained at 242 degrees? *A*. Possibly.

xQ. 51. If you desire to drive water out of a solution would it not be an obvious thing to raise the temperature to facilitate the expulsion of the water?

A. I should say that that would depend very largely upon what the solution was, and whether or not the raising of the temperature would involve any deleterious effects upon any of the ingredients or upon the compound as a whole. Moreover, I can perceive that in some cases the raising of the temperature might facilitate the expulsion of the water, while in others there would be involved the extra expense of the high temperature without the equivalent result in the more rapid expulsion of the water.

xQ. 52. Take the present case. Here the patentee suggestes heating the composition to the temperature of 242 degrees, and states that the heat "may be" raised to 300 degrees which you say facilitates the expulsion of the water. Does this expedient strike you as being obvious, or would you regard it as non-obvious?

A. It would take one better versed in the chemistry of the compositions under consideration than I am to state whether or not it is obvious that the temperature could be increased to 300 degrees without deleterious effects.

xQ. 53. Whether the effect of raising the temperature was deleterious or not could, I presume, be detected by a skilled chemist familiar with these compositions. Is that so?

A. Whether or not this could be done without experimentation by a skilled chemist I do not know.

xQ. 54. In your direct examination, you refer to the employment of paraffin, ozokerite or ceresin "to bring the mixture to the desired degree of hardness. Is this the only function that so far as you know is performed by the added material?

A. The patent in suit states that the purpose of adding the paraffin, ozokerite or ceresin is to bring the composition "to the desired degree of hardness." I would not undertake to state that this is the only function of such material, but I know that the employment of paraffin, ozekerite or ceresin for the purpose of "tempering" the degree of hardness or softness of wax-like compositions is recognized in the art. For example, in the Aylsworth patent No. 782,375, page 2, lines 115-121, it is stated that paraffin, ozokerite or ceresin when added to a metallic soap composition will make the composition "less brittle than it otherwise would be." It is also stated in the same lines that it would make the mixture "non-hygroscopic." Possibly it might have this function.

xQ. 55. I notice that in formula "A" of the patent in suit, the alkali used for saponifying the stearic acid is caustic soda lye, and that in formula "B" the alkali employed is a mixture of caustic soda lye and sal soda. Do you regard caustic soda lye and sal soda as equivalents in the art?

A. I understand that the patentee regarded straight caustic soda lye as the practical equivalent of caustic soda lye and sal soda. I am not chemist enough to state whether he was correct in this or not. I assume that he is.

xQ. 56. Can you inform me whether the caustic soda of formula "B" can be dispensed with, leaving the other ingredients as they are and correspondingly increasing the proportion of sal soda?

A. I do not know. Possibly it might involve a change in the other ingredients.

xQ. 57. I call your attention to the fact that in formula "A" 85 pounds of caustic soda lye are used, and in formula "B" only 9 pounds of caustic soda lye are used. Would this indicate that the relative proportions of the ingredients employed can be materially varied?

A. Formula "A" uses a different amount of stearic acid, a different amount of aluminic hydrate and a different amount of soda lye from the corresponding elements in formula "B." The aluminium in formula "A" is in the form of aluminic hydrate; whereas in formula "B" it is powdered aluminium. In formula "B" there is added 60 pounds of sal soda dissolved in 12 gallons of water. To a layman it would appear that the sal soda in formula "B" in some way compensates for the smaller proportion of caustic soda lye employed, but this is a question which a chemist could answer much more intelligently than myself.

xQ. 58. I appreciate of course that you are a layman in chemical matters, but I think the Court is entitled to know your opinion as to the scope of the patent in suit—whether that patent is a narrow patent limited practically to the special formulas recited therein, or whether it is a broad patent, and to determine this it seems to me that the court should be advised whether, in your opinion, you consider it possible to vary these two formulas, and if so to what extent?

A. I do not think the patent is limited to the precise proportions or parts given in either of the two formulas, but I regard such formulas as merely given as illustrating the inventive idea which is embodied in the patent. The saponification of the stearic acid, for example, is effected in formula "A" by the caustic soda lye, and in formula "B" by the caustic soda lye and the sal soda solution. It is one of the characteristics of the invention, however, that only a partial saponification of the stearic acid is effected, and the patent states that this is "about two-fifths saponification." It is added, however, that this is the proportion which gives the best results, but is of course variable within limits. I therefore understand that the proportions of the alkali and the stearic acid employed may vary without departing from the invention set forth in the patent.

xQ. 59. In making a comparison between formula "B" of the patent in suit and the formula described in Aylsworth's patent No. 782,375, you refer to the fact that in the former 69 pounds of alkali (caustic soda 9 pounds, sal soda 60 pounds) are used to effect the partial saponification of 300 pounds of stearic acid, while in the latter 22.5 pounds of alkali (caustic soda 1 pound, sal soda 21.5 pounds) are used to partially saponify 100 pounds of stearic acid. Can you inform me of the extent of the variation of the respective saponification which would be expected in each of these cases?

A. Not of my own knowledge. On making inquiry of a professional chemist, however, I learned that in each case the saponification would be somewhere between 40 and 50%, and that absolue determination of the per cent. would be impossible without more accurate chemical knowledge as to the precise purity of the ingredients.

xQ. 60. Without going into the details of the several claims of the patent in suit, is it not a fact that the essentially novel point alleged to be covered by them is the use of aluminium in a composition for talking machine records?

A. I do not so read the patent. It is for a novel process consisting of a series of steps and for a composition consisting of certain specified ingredients.

xQ. 61. Well, then, let us take up the claims in order. Concerning the first claim, do you understand that the patentee was the first to adopt a process for making sound records in which a metal was dissolved in soda lye and the solution added to stearic acid? In other words, would not a process as so defined not limited to aluminium, apply to the lead soaps referred to in the patent in suit?

A. Claim 1 is limited specifically to the employment of aluminium. In addition to this, the claim requires that the aluminium shall be incorporated into the material in a specific way, viz., by dissolving the aluminium into soda lye and adding this solution to the stearic acid. If we ignore the word "aluminium" and read it as if it said "metal" and if we assume that metals other than aluminium have been dissolved in soda lye and the solution added to stearic acid, then with the claim thus altered possibly the process would define the steps previously employed. So far as appears, however, it was new to dissolve aluminium to soda lye and add the solution to stearic acid; *i. e.,* it was new to practice the process of claim 1 in making sound recording material.

xQ. 62. Having reference still to claim 1, if the prior art disclosed the same process in connection with a lead soap how would the process as such differ when aluminium is used? Would not the same steps be carried out in the same order, and for the accomplishment of the same result?

A. That would depend upon whether the action of the soda lye upon the lead was the same as the action of the soda lye upon the aluminium; and whether the solution if such solution were obtained would act in the same way upon stearic acid; and further on whether you would get the same result by employing lead as you would in employing aluminium.

xQ. 63. Is not metallic lead soluble in caustic soda?

A. I do not know.

xQ. 64. What I am trying to ascertain is: in what way the presence of aluminium affects the process carried out; that is to say, the steps performed in making the composition. If, in one process, we dissolved lead in soda lye and add the solution to stearic acid, and in another process we dissolve aluminum in soda lye and add the solution to stearic acid, why are we not carrying out the same process in each case?

A. With my limited knowledge of chemistry I should say that generically the processes might be the same, while specifically they would be different. One would give you a composition of matter having stearate of lead therein, while the other would give you a composition having stearate of aluminium. The products would be specifically different by reason of the specific variation in the process. The patent in suit informs us that "tablets made of insoluble lime soap or of stearates or oleates of lead have never yielded commercially successful results"; whereas, I know, as a matter of fact, that tablets made in accordance with the process of claim 1 have given commercially satisfactory results.

xQ. 65. If I dissolve metallic lead in caustic soda and dissolve metallic aluminium at the same time in another batch of caustic soda, is it your opinion that apart from the solution resulting in each case, I perform two different processes?

A. Specifically, yes; generically, no.

xQ. 66. Kindly assume that in the manufacture of recording material, using lead, the lead was dissolved in soda lye and the solution then added to the stearic acid. That being so, I suppose you will admit that the only difference between such a process and that recited in claim 1 of the patent in suit is in the employment of aluminium? *A*. Yes.

xQ. 67. Having reference to the second claim of the patent in suit, what, if any, do you consider to be the essential feature thereof?

A. I do not find in the patent anything that indicates any particular feature as the "essential" feature of the claim. I rather regard it as a process as a whole, to be looked at and considered as an entirety.

xQ. 68. Do you regard the patentee as being the first to suggest the saponification of melted stearic acid free from glycerine and oleates in the presence of heat?

A. I have no information on that point.

xQ. 69. Regarding the third claim, I ask the same question, except the saponification shall be only a partial saponification of the stearic acid?

A. My answer to this question is, of course, the same.

xQ. 70. Rergarding the fourth caim, was the patentee the first to suggest saponifying stearic acid with soda lye in the presence of heat to produce about a 40% saponification?

A. So far as I am informed, yes.

xQ. 71. By whom have you been informed?

A. The only information I have is that which I obtained from the patent, and from the fact that the Patent Office examiners granted the patent.

xQ. 72. This being so, since the fourth claim is not specifically limited to the use of aluminium, and since the first three claims which we have been considering are so limited, would not the patent itself indicate that the employment of aluminium was regarded by the patentee as the essence of the first three claims?

A. It would certainly appear that the first three claims were limited to a process in which aluminium was employed. It does not follow that aluminium is the "essence" of the claims. It simply means that in these claims the patentee has limited the process to the employment of the specific metal aluminium.

xQ. 73. Regarding the fifth claim, is it your understanding that the patentee was the first to suggest adding boiling soda lye to pure stearic acid heated to about the same temperature, and continuing the heating until moisture is expelled?

A. I do not see anything either in the claim or the specification that no states, and other than what I find in the patent I am without information.

xQ. 74. Is it your understanding of the process of the sixth claim that the molding of the composition into tablet form and then quickly cooling immediately follows the heating operation by which moisture is expelled?

A. The claim does not state whether the molding shall immediately follow the heating for the expulsion of moisture or not. I understand the claim to be phrased in terms broad enough to include the immediate molding of the tablet after the moisture has been expelled, and also the molding of the material at any time after the moisture is expelled. For example, the heating might be continued until the moisture is expelled from the material and as soon as this is accomplished the material might be molded; or, the heating having been continued until the moisture is expelled, the molding might not take place until some considerable time after the moisture is expelled.

xQ. 75. In the latter case, what becomes of the composition between the time that the moisture is expelled and the molding operation?

A. I should rather surmise that it was retained in the vessel in which the heating had taken place.

xQ. 76. Having reference to the seventh claim, is it your understanding that the patentee was the first to partially saponify stearic acid with soda lye?

A. The seventh claim does not call for the partial saponification of stearic acid with soda lye, but for the partial saponification of stearic acid with soda lye having aluminium therein. From what I learn from the patent, and from the fact that the Patent Office granted this claim, I understand that the patentee was the first to perform this operation.

xQ. 77. In considering the claims, I have been trying to ascertain the alleged invention which they purport to cover. You have intimated that the patentee may in your opinion have done more than to add aluminium to a sound record composition. I have therefore been asking you about the other steps of the claims, and I therefore repeat my question, namely, do you understand that the patentee was the first to suggest the partial saponification of stearic acid with soda lye?

A. I understand your question practically to be whether or not, so far as I know, any one ever partially saponified stearic acid with soda lye prior to the date of the invention of the patent in suit. I would say I do not know.

xQ. 78. Regarding the eighth claim, is the patentee the first to suggest adding caustic soda lye to melted stearic acid and heating the mixture?

A. I understand the process of making soap by the use of stearic acid and soda lye consists in adding the lye to the stearic acid in the presence of heat. Whether it was new to melt the stearic acid, then add the caustic soda lye, and then heat the mixture, I cannot say.

xQ. 79. Having reference to the ninth claim, do you understand that the patentee was the first to add soda lye to stearic acid, heating the mixture, and adding a softening material such as paraffin? *A.* I do not know.

xQ. 80. Having reference to the tenth claim, is it your understanding that the patentee was the first to suggest the composition of matter formed of pure stearic acid, partly saponified by caustic soda? *A.* So far as I am informed, he was.

xQ. 81. Regarding the eleventh claim, what would be the result if we did exactly what the claim calls for, namely, if we add aluminate of soda to stearic acid and heat the mixture?

A. Without undertaking to state the chemistry of the matter, I should say that the aluminate of soda would react on the stearic acid and produce what might be called an aluminate of soda soap.

xQ. 82. Your idea is then that aluminate of soda is an alkali which will produce saponification with the stearic acid?

A. That might depend upon whether the aluminate of soda was one in which there was an atom of aluminium for each atom of soda lye employed, or whether there was free alkali with the aluminate of soda. I am not sufficiently learned in the chemistry of soaps to answer with any degree of accuracy.

xQ. 83. You are not able to say, then, that if we add aluminate of soda to stearic acid and heat the mixture, a useful effect will be secured?

A. If in forming the aluminate of soda there were present only soda lye sufficient to constitute the chemical equivalent of the aluminium employed, and were no free caustic soda present, so far as my knowledge of chemistry goes there would be no reaction between the aluminate of soda and the stearic acid. Just what effect the heating of the mixture would have, however, I would not undertake to say.

xQ. 84. If it is a fact that prior to the date of the invention of the alleged invention of the patent in suit, sound record compositions had been made by partially saponifying stearic acid by caustic soda to form a metallic soap, would the addition of aluminium thereto result in a substantially new composition?

A. Yes, sir.

xQ. 85. If paraffin, ceresin and ozokerite had all been used as ingredients of sound records, would the use of either of these materials in connection with a metallic soap formed by saponifying stearic acid by means of caustic soda, in which aluminium was dissolved, result in your opinion in a new composition?

A. Yes, sir.

xQ. 86. Is it your understanding that the claims of the patent in suit are to be regarded as covering new processes and compositions, even though the steps of the process may be individually old and the ingredients of the composition individually old?

A. I understand the process claims of the patent in suit to be for complete processes as such without regard as to whether the individual steps, as such, have been employed or not, and I understand the composition claim of the patent in suit to be for the composition defined in the claim without any allegation that the ingredients entering into the composition are separately new.

xQ. 87. And would you consider the process claims new if the same steps had been carried out in connection with lead, the only difference being that with one process lead was dissolved in caustic soda and with the other process aluminium was dissolved therein?

A. Yes, if a superior result was obtained, as the patent says it was. Moreover, I could conceive that there might be difficulties in the employment of lead, or rather in the practice of the process when lead was employed, which would not exist when aluminium was employed.

xQ. 88. I have in my possession a book entitled "Proceedings of the First Annual Convention of Local Phonograph Companies of the United States, held at Chicago, May 28 and 29, 1880," from which it appears that at that date there were over thirty companies in the talking machine business in this country. Do I understand that you believe that all of these concerns from that date up to the date of the alleged invention of the patent in suit had to content themselves with the objectionable records to which you have referred, such records being characterized by the presence of foreign bodies, by crystallization and by efflorescence?

A. I am without any belief on the subject. I do not know that thirty companies existed. I do not know whether they were contented or discontented.

Cross-examination closed.

Signature of witness waived.

Certificate of notary waived.

1

United States Circuit Court

DISTRICT OF NEW JERSEY

AMERICAN GRAPHOPHONE COMPANY,
Complainant

vs

NATIONAL PHONOGRAPH COMPANY,
Defendant.

In Equity.
On Letters Patent
No. 606,725 2

The answer of National Phonograph Company, defendant, to the Bill of Complaint of American Graphophone Company, complainant.

3 This defendant, now and at all times hereafter, saving and reserving to itself all and all manner of benefit and advantage of exception which can or may be had or taken to the manifold errors, uncertainties, imperfections and insufficiencies of the bill of complaint, as answer thereto, or to so much thereof as it is advised is material or necessary to make answer unto, answering says:

1. Defendant admits that it is a corporation organized and existing under the laws of the State of 4 New Jersey and a resident of said State, having its principal office at West Orange in the County of Essex in said State, and it admits that the complainant is a corporation created and existing under and by virtue of the laws of the State of West Virginia, and having an office at Bridgeport, in the State of Connecticut.

2. Defendant, on information and belief, denies that on or prior to the 27th day of November 1896,

5 Thomas H. Macdonald was the original, first and sole inventor of certain new and useful improvements in the Manufacture of Graphophone Tablets, and denies that the said alleged invention was not known or used by others in the United States, and not patented or described in any printed publication in this or any foreign country before Macdonald's alleged invention or discovery thereof, or before the date last mentioned; and denies that the alleged invention was 6 not in public use or on sale in the United States for more than two years prior to said date, and that the alleged invention had not been abandoned.

3. Defendant is not informed, save by the bill of complaint, and therefore on information and belief denies that said Macdonald made application in due form of law to the Commissioner of Patents for the grant of Letters Patent of the United States for the said alleged invention; that he complied with the 7 provisions and requirements of the laws of the United States in such cases made and provided, and that no application for foreign patent thereon had then been filed.

4. Defendant is not informed, save by the bill of complaint herein, and therefore on information and belief denies that the said application for Letters Patent and the said alleged invention covered thereby was duly assigned to the com- 8 plainant by the said Macdonald; defendant admits that Letters Patent numbered 606,725 were granted to the complainant, American Graphophone Company as assignee of said Macdonald on July 5, 1898, but defendant denies that said Letters Patent secured to complainant, its successors and assigns, any exclusive rights whatsoever.

5. Defendant further answering says that it is not informed, save by the bill of complaint, whether the said complainant has been, ever since the date of the

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grant of the said Letters Patent and is now the sole and exclusive owner of the said Letters Patent and of all claims for infringement thereof, and therefore denies the same; and denies that complainant is entitled to the exclusive use, benefits and advantages of the said alleged invention and to sue for and recover to its own use and in its own name all claims for infringement or violation thereof, and denies that complainant has granted no license under said Letters Patent.

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6. Defendant further answering on information and belief denies that complainant has expended large sums of money in developing the alleged invention of the patent in suit and introducing the product thereof into public use; it denies that complainant has created a great public demand for the said product and denies that complainant is able and willing to supply the same. Defendant denies that complainant has been in the exclusive possession and enjoyment of the alleged invention and patent since the date of assignment thereof; 11
denies that the public at large has recognized and acquiesced in the value of the said alleged invention and in the validity of the said patent and complainant's title thereto, and defendant denies that but for the acts complained of, complainant would be in the peaceful possession and enjoyment of the said Letters Patent or of said alleged invention or of the income derivable therefrom.

7. Defendant further answering on information and belief denies that the complainant and all persons manufacturing under its authority have affixed to the articles made in accordance with the patent herein sued upon the word "patented" with the date and year of the grant thereof, and denies that complainant has been sufficiently notified by complainant of the infringement complained of and has refused to desist therefrom. 12

8. Defendant denies that this defendant within the said District of New Jersey or elsewhere in the United

13 States, before the verification of the bill of complaint herein, and after the alleged acquirement of title to the said patent by complainant, and without complainant's consent, has infringed the said Letters Patent herein by making or using or selling or by causing to be made or used or sold, Graphophone Tablets infringing upon any rights secured to complainant by said Letters Patent; defendant denies that it has damaged the complainant; it denies that it has received large
14 or any gains or profits by any infringement of the patent in suit and denies that it has threatened to continue its alleged infringement to a greater or any extent, or to complainant's irreparable damage or injury.

9. Defendant further answering, on information and belief, says that the said Letters Patent are void by reason of the public manufacture, use and sale by the Edison Phonograph Works, a New Jersey corporation,
15 at West Orange, New Jersey and by North American Phonograph Company, a New Jersey corporation, at Philadelphia, Pennsylvania and elsewhere in the United States and by licensees of the North American Phonograph Company in the United States, of the said alleged invention or inventions described and claimed in said Letters Patent for more than two years prior to the date of the said application for Letters Patent No. 606,725.

16 10. Defendant further answering, on information and belief, says that the said Letters Patent herein sued upon are invalid and void, because the same were obtained surreptitiously and unjustly for an invention which was, in fact, invented by another or by others who were using reasonable diligence in adapting and perfecting the same, namely:—

By Thomas A. Edison at West Orange, New Jersey, now residing at Llewellyn Park, Orange, New Jersey.

By Jonas W. Aylsworth at West Orange, New Jersey, now residing at East Orange, New Jersey.

11. Defendant further answering on information and belief, says that the said Letters Patent here in suit are invalid and void, because the alleged invention described and claimed therein or substantial and material parts thereof had been patented and described in certain Letters Patent and printed publications prior to the alleged invention or discovery thereof by the said Thomas H. McDonald, to wit : 17

United States Letters Patent. 18

No. 400,648, dated April 2, 1889 to Thomas A. Edison
400,650, dated April 2, 1889, to Thomas A. Edison
406,576, dated July 9, 1889 to Thomas A. Edison
414,759, dated November 12, 1889, to Thomas A. Edison
430,274, dated June 17, 1890, to Thomas A. Edison

British Letters Patent. 19

No. 12,593, dated September 1, 1889 to George E. Gouraud
7,794, dated May 9, 1889 to George E. Gouraud

French Letters Patent.

No. 193,452, dated October 10, 1888 to Thomas A. Edison

Danish Letters Patent. 20

No. 651, dated July 12, 1894, to Edison United Phonograph Co.

Swedish Letters Patent.

No. 2,594, dated Dec. 7, 1888 to Thomas A. Edison

12. Defendant further answering on information and belief, says that said Letters Patent

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21 No. 606,725 are invalid and void for the reason the that said Macdonald was not the original and first inventor or discoverer of the alleged improvement therein described and claimed, or of any substantial and material part thereof, and that the same was invented by, known to and used by others prior to any invention thereof by said Macdonald, namely:

At West Orange, N. J., by Thomas A. Edison, who
22 resides at Llewellyn Park, Orange, Essex County, New
Jersey.

At West Orange, New Jersey and elsewhere within the United States by Jonas W. Aylsworth, who resides at East Orange, New Jersey.

At West Orange, New Jersey, and elsewhere within the United States by Walter H. Miller, who resides at Orange, New Jersey.

At Evansville, Indiana and at Bridgeport, Connecticut, and elsewhere within the United States by
23 Adolph Melzer, who resides at Evansville, Indiana.

At Evansville, Indiana and elsewhere within the United States by Charles Melzer who resides at Montclair, Colorado.

13. Defendant further answering on information and
belief, says that said Letters Patent No. 606,725 are
invalid and void, because the said alleged improvements
attempted to be patented thereby, did not, at the
date of the application for said Letters Patent or at
24 the date of the alleged invention thereof by the said
Macdonald, involve or require invention; that in view
of the state of the art as it existed at that time, it did
not require the exercise of the inventive faculty to devise
and produce the processes and composition described
and claimed in said Letters Patent, but merely
the exercise of chemical skill; and that the alleged invention
of said Letters Patent did not produce any
new and useful result not already known to others and
in common use by others skilled in the art of manufacturing
phonograph records and blanks, prior to the

25 date of said application and prior to the alleged invention thereof by said Macdonald.

14. Defendant further answering on information and belief, says that for the purpose of deceiving the public, the description and specification filed by the said Macdonald in the Patent Office in connection with his said application for the Letters Patent here in suit, was made to contain less than the whole truth relative to his alleged invention or discovery or more than is 26 necessary to produce the desired effect; and that the said Letters Patent are therefore invalid and void.

15. Defendant further answering on information and belief says that said Letters Patent No. 606,725 are invalid and void because the alleged invention attempted to be patented thereby had been abandoned to the public prior to the date of the application for said Letters Patent.

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16. Defendant further answering alleges that complainant is estopped from bringing or maintaining any suit on said patent against defendant based upon the manufacture, use or sale of "Edison" records or "Edison" blanks, by reason of an agreement entered into on December 7, 1896, between complainant on the one hand and defendant and the Edison Phonograph Works on the other hand; said agreement providing that neither interest will bring suit against such types of apparatus or supplies as have been put out com- 28 mercially by the other interest before the date of said contract, whether put out by either interest before or after said contract, to which agreement ready in court to be produced, defendant prays leave to refer. And defendant says that all Edison records, so far as the same resemble the alleged invention covered by said patent and all Edison blanks manufactured, used and sold by defendant, upon which manufacture, use and sale the bill herein is apparently based, are of the same type as those used and sold by this defendant at and

29 before the date of said agreement and that complainant is therefore estopped from maintaining this suit.

And now, this defendant having answered all and singular those portions of the bill of complaint that it is material and necessary to answer, denies all and all manner of things in the said bill alleged which are not hereinbefore specifically answered unto; and it prays the same benefit of the several matters and things hereinbefore alleged and set
30 forth, as if by reason thereof it had demurred or had pleaded to the said bill; and it prays to be hence dismissed with its reasonable costs and charges herein most wrongfully sustained.

West Orange, New Jersey, June 7th, 1905.

National Phonograph Co.,
by William E. Gilmore,
President.

Frank L. Dyer,
Solicitor and of Counsel for Defendant.

31

State of New Jersey }
County of Essex } ss:

William E. Gilmore, being duly sworn deposes and says as follows: I am President of the National Phonograph Company, the defendant named in the foregoing answer to the bill of complaint of the Am-
32 erican Graphophone Company. I have read the said answer and know the contents thereof to be true, except as to those matters therein alleged upon information and belief, and as to those matters I believe it to be true.

William E. Gilmore.

Sworn to and subscribed before me this 7th day of June, 1905

Edgar N. Dennison,
(Seal) Notary Public.

33

IN THE CIRCUIT COURT OF THE UNITED STATES

For the District of New Jersey.

American Graphophone Company,
vs.
National Phonograph Company,

In Equity, No. 10
March Term, 1905.

On Macdonald Patent No. 606,725. 34

Proofs for final hearing taken on behalf of defendant at the Edison Laboratory, Orange, New Jersey, before H. D. Oliphant, Esq., a Standing Examiner of this Court, pursuant to the 67th Rule, commencing Monday, December 18th, 1905, at 10.15 A. M. 35

Present:
R. L. Scott, Esq. for Complainant.
Frank L. Dyer, Esq., for Defendant.

Mr. Scott states that Mr. Mauro has instructed him to attend upon the direct examination and to reserve for Mr. Mauro the right to interpose objections to any of the various questions and answers before proceeding with the cross-examination. 3

Mr. Dyer consents to this arrangement.

Counsel for defendant offers in evidence a certified copy of the file wrapper and contents of the application for the Macdonald patent in suit, No. 606725, and the same is marked " Defendant's Exhibit, Macdonald File Wrapper ".

37

Jonas W. Aylsworth.

Jonas W. Aylsworth, a witness on behalf of defendant, having been first duly sworn, testifies in answer to questions by Mr. Dyer, as follows:

Direct Examination by Mr. Dyer:

Q. 1. Give your name, age, residence and occupa-
38 tion?

A. Jonas Walter Aylsworth, 36, residence 223 Midland Avenue, East Orange, occupation—chemist and experimenter.

Q. 2. Have you ever had any experience in connection with compositions for phonograph records or blanks?

A. I have.

Q. 3. Without going at this time into the details of
any experiments that you may have made in this line,
39 state generally what your experience has been?

A. I began to work for Mr. Edison in the Fall
of 1887 and continued until 1891, during which
time most of my work was on wax compositions for
use in the phonograph. In January, 1891, I left the
Laboratory to take a position with the Edison Lamp
Works in their Filament Department which was then
located in Jersey City. I continued there and at the
factory at Harrison, until 1894. During this period I
still superintended the wax manufacture in an advisory
40 way, and made a number of experiments for the same.
From 1894 to 1898 I was in business of my own with
the firm of Aylsworth & Jackson; we manufactured filaments for incandescent lamps, and fluoroscopes for use in X-ray apparatus. During this period and also up to the present, I have been retained by the Edison Phonograph Works and National Phonograph Company as an expert on wax compositions.

Q. 4. In what way are wax compositions used in the phonograph?

A. To manufacture the cylinder or tablet upon which the sound record is cut or molded.

41

Q. 5. When did you start to work on your experiments in connection with these compositions ?

A. I think it was in January, 1888. I worked for a short time on treating bamboo filaments for incandescent lamps, and then took up work on wax compositions.

Q. 6. At that time, namely, January 1888, was the phonograph in public use ?

A. They had manufactured a number of phonographs up to that time, but I cannot say how many were in 42 public use at that time.

Q. 7. When are you able to state of your own knowledge that phonographs were publicly used ?

A. I know that the present plant for manufacturing phonographs was built during 1888 and 1889, the latter part of 1888 and first part of 1889, and that they manufactured and shipped phonographs in considerable quantities during the year 1889. I know that they were in public use at that time.

Q. 8. In January 1888, when you began your ex- 43 periments on record compositions, what was the composition that was used by Mr. Edison ?

> Objected to as incompetent and as calling for secondary evidence.

A. The composition that was in use when I began experimenting on wax composition was a mixture of carnauba wax and ceresin in the proportions of about 100 parts ceresin to about 30 parts carnauba wax. 44

Q. 9. Did you keep a record of your experiments on the compositions.

A. I did and produce three note books of my experiments numbered 564, 565 and 1000.

> Counsel for defendant offers in evidence the three note books produced by the witness and the same are marked respectively " Defendant's Exhibit, Aylsworth Note-book No. 564," " De-

45 fendant's Exhibit, Aylsworth Note-book No. 565" and "Defendant's Exhibit, Aylsworth Note-book No. 1000."

Q. 10. What was your practice in connection with the keeping of these note-books?

A. It was my practice to make rough notes with the intention of afterwards fixing them up in better shape; that is to say, copying them in other note-books and
46 separating all wax composition experiments from other experiments that were made at different times and appearing on the rough note-books or on separate sheets. A great many of the samples referred to in these note-books were preserved and can be produced, if wanted.

Q. 11. Can you produce any of the note-books in which you kept your original notes?

A. Yes, I produce two of these original note-books, one marked "Aylsworth No. 50" and the other marked "No. 533."

47 Counsel for defendant offers in evidence the two original note-books produced by the witness and the same are marked respectively "Defendant's Exhibit, Aylsworth Note-book No. 50" and "Defendant's Exhibit, Aylsworth Note-book No. 533."

Q. 12. Do I understand that your note-books No. 564, No. 565 and No. 1000, which you have produced,
48 are made up entirely of rough notes of experiments copied into them, or do any of these note-books contain original notes of experiments?

A. No. 565, I think, was used as an original note-book after copies had been made from the rough notes but beginning with just what numbers I am unable to state. Note-book No. 1000 is an original note-book. Note-book 564 is made up of copied notes, as I now remember.

Q. 13. Having reference to note-book No. 533, I observe that certain of the experiments recorded

therein are numbered from 857 to 1011. Kindly explain 49
the significance of these numbers and point out
what relation, if any, note-book No. 533 bears to note-book
No. 565 ?

A. At the time the original notes were copied from
book No. 533 into book No. 565, the new series of numbers
given in book No. 565 were marked in the former
book No. 533; for instance, Experiment No. 1 in book
No. 533 is copied in book No. 565 as Experiment No.
857, and Experiment No. 21 in book No. 533 is copied 50
in book No. 565 as Experiment No. 878, and at the
same time the number 878 is marked in the old book.
The object in doing this was in case of any mistake in
copying, I could refer to the original notes.

Q. 14. Are you able to fix the dates when the experiments
referred to in the note book No. 533 for example,
were entered therein?

A. I received book No. 533 on November 13, 1888;
at the time I received it from the storekeeper in the
Laboratory, he numbered it and wrote my name and 51
date on the inside of the cover of the book. This was
the practice in giving out note books to experimenters
in the Laboratory at this time. The experiments contained
in this book were made from November 13,
1888, as fixed by the date on the cover and by an experiment
recorded in the book on December 6th, 1888.
However, note book No. 565 was copied some time
subsequent to July 31, 1889, and during the time that the
notes were copied in book No. 565, experiments were
recorded in the original note book, No. 533, and just at 52
what time No. 565 was used as an original book, I am
unable to say, excepting that at the time the notes
were copied in No. 565, my memory was fresh on the
subject and any dates given in it I am sure are correct;
except in book No. 564, which is the first volume of
the copied notes, I have written January 1st, 1887,
which should be January 1st, 1888. This date appears
on the first page of book No. 564. In note book No.
533, which I have called an original note book, a great
many of the experiments that are written up in this

53 book were copied from rough notes on loose pieces of paper, as that was generally my practice. It is possible that some of the experiments recorded in this note book were made previous to November 13th, 1888. I am positive that all the experiments recorded in note book No. 533 were made before they were copied in No. 565, because the last experiment recorded in No. 533, which was copied on book No. 565 as No. 1011, was made previous to May 30th, 1889, as that is the
54 date given in note book No. 565 to experiment No. 1022, which is the nearest date recorded to No. 1011.

Q. 15. Having reference now to note book No. 564, please state generally what you find to be included in the first 737 experiments?

A. Up to No. 708, which was made March 20th, 1888, the experiments comprised chiefly an admixture of natural waxes, gums and resins in various proportions, together with some miscellaneous experiments on treating carnauba wax to partly saponify it, and
55 mixing the same with ceresin; experiments with natural asphalt, and some few experiments on crystallization. Then, following number 708 up to 737, experiments were confined chiefly to trying to produce a wax-like material from chloride of lead to imitate the mineral, chloride of lead, which was described in Watt's Dictionary, as a horn-like substance.

Q. 16. Under date of May 27th, 1888, I find the following experiment noted:

56 "No. 739. Metallic Salts of Fatty Acids."

> Oleic acid is saponified by $\frac{1}{8}$ of its weight of Lewis Lye, and the resulting soap dissolved in hot water and precipitated by excess of a solution of acetate of lead, the precipitate washed, dryed and fused.
>
> Result was a very amorphous, plastic, translucent, brownish, waxy mass, which very much resembles crude Japan wax. When mixed with carnauba in the proportion of 100 of the oleate

57

> to 30 carnauba, it formed a very good phono wax, non-electric, and with very little scratch, very heavy shaving. Very encouraging, as it gives an opening to a new and promising field."

Please explain fully when this experiment was made, its purpose, and if you recall, its result?

A. I recall the experiment very distinctly, because it marked the starting of experiments in an entirely new line. Heretofore experiments had been limited 58 chiefly to natural waxes and materials of a wax-like nature. This experiment opened up a new field, whereby artificial wax-like materials were made. The success of this experiment was instrumental in making a whole series of similar compounds. It was reasoned that if a solid wax-like material could be made from oleic acid combined with lead, materials of any desired properties might result by similar combination of a fatty acid with lead and other metallic bases.

Q. 17. What is "Lewis Lye" referred to in experiment No. 739? 59

A. Lewis Lye is a preparation of dry, caustic soda, which could be procured in any grocery store and is much used for soap-making.

Q. 18. Explain how the oleic acid was saponified by the caustic soda?

A. A solution was made of the caustic soda, or Lewis Lye, with water, and this added gradually to the oleic acid, whereby a reaction takes place, generating considerable heat. After the lye was all added, the 60 material was cooked for some time at a temperature of boiling water to insure the complete saponification of the oleic acid. Also, it was necessary to add the caustic soda in a definite proportion, in order to make a normal soap. Then the soap formed was dissolved in water and a solution of acetate of lead was added thereto, which caused a precipitate to take place, consisting of oleate of lead, there being an exchange of acids, the oleic acid leaving the soda and going to the lead and the acetic acid leaving the lead and combining

61 with the soda. Such reactions are very common in chemistry and are known as double decompositions. In this case, one of the products of the decomposition separates out as a precipitate and the other product remains in the solution as a soluble salt.

Q. 19. With this experiment then, as I understand it, there was a substantially complete saponification of of the oleic acid?

A. Yes.

62 Q. 20. What is the principal source and what are the general characteristics of oleic acid?

A. The principal sources are tallow, lard, and many of the vegetable oils, such as cotton seed oil, peanut oil, palm oil and cocoanut oil. Its characteristics are, first, an oil-like liquid, insoluble in water, second, it is of an acid fatty nature, capable of combining with alkalies and certain organic bases, such as glycerine, from which it is usually separated in its production, and third, it is an acid which undergoes change, when 36 uncombined with a base, due to the absorption of oxygen, which causes it to assume a red coloration from which its common name, "red oil," is derived. The pure oleic acid is a colorless oil and remains liquid at all ordinary temperatures, but it will solidify into a fatty solid when cooled to a low degree.

Q. 21. What was the chemical product obtained as a result of the procedure of experiment No. 739.

A. Oleate of lead. This is a solid wax-like material.

Q. 22. Please refer now to experiments up to No. 64 768, and state briefly what they consisted of?

A. They are experiments on production of oleates of the different metallic bases, such as lead, zinc, magsium, copper, cobalt, mercury, calcium, aluminum, silver, strontiun, manganese, barium and chromium, and combinations of these metallic oleates with ceresin and carnauba wax. These metallic oleates were formed in substantially the same manner as the lead oleates mentioned in No. 739.

Q. 23. Were the metallic oleates to which you have

65 referred considered satisfactory as a suitable material for phonograph records ?

A. No, they required admixtures with some material which would give them hardness, a property which they themselves did not possess. The different admixtures of the oleates did not make entirely satisfactory compositions, because these admixtures did not mold perfectly and were not much of an improvement in record production on the phonograph over the material which was then used, consisting of carnauba wax 66 and ceresin.

Q. 24. Consider experiments from No. 769 to No. 777 in note book No. 564 and explain what they consisted of, and the results obtained, if you now recall them ?

A. They consisted of a similar series of compounds in which the oleic acid was substituted by palmitic acid. Palmitic acid is a solid fatty acid at ordinary temperatures. The products in this case were much harder than those formed where oleic acid was used. This 67 was important, because it enabled us to do away with carnauba wax which had previously been used as a hardener. Some of these experiments made improved compositions, but the experiments were not stopped after the palmitates had been made.

Q. 25. What is the source and characteristics of palmitic acid ?

A. Animal and vegetable fats, such as lard, palm oil, cocoanut oil, cotton seed oil, where it occurs together with oleic acid in large proportions and varying pro- 68 portions of stearic acid, and other more uncommon fatty acids. Palmitic acid is a solid crystaline fatty acid, melting somewhere around 54 degrees centigrade, and is very closely allied in chemical and physical properties to stearic acid.

Q. 26. When palmitic acid is used instead of the oleic acid, what was the product obtained in connection with experiments from 769 to 777 ?

A. Metallic palmitates, such as palmitate of lead, soda, calcium, etc.

69

Q. 27. Were these metallic palmitates satisfactory as materials for the purpose?

A. No, they were not entirely satisfactory, as some of them were so high in melting point that they could not be molded readily. They were very much of an improvement over anything before obtained, but the palmitic acid as such was rather expensive and none of those compositions were adopted.

Q. 28. Please consider experiments in note book, No.
70 564, from Experiment No. 779 to Experiment No. 793
inclusive, and explain the same?

A. In these experiments miscellaneous metallic soaps
were made, in which certain neutral fats and other
materials were saponified and precipitated by metallic
salts in the same manner as that describing the production of lead oleate and oleates of other metals.
Among the materials mentioned are palm oil and rosin.
Quite a number of metallic salts were formed of this
latter material. These compounds are resinates of the
71 different metals. They were not very promising, as
they all seem to be infusible, that is, without decomposition.

Q. 29. Please refer to experiments Nos. 794 to 800 in note book No. 564, and explain the same, and state what compounds were obtained and their properties.

A. These compounds were similar to those before
mentioned, but with this difference: Stearic acid was
substituted for the oleic in the same manner that palmitic had been substituted for the oleic. The result-
72 ant products in this case were stearates of metallic
bases, such as stearate of soda, which was first formed,
and stearate of lead, stearate of aluminum, maganese,
copper, iron, etc. In making these materials the same
general method was used as in the production of the
oleates, that is, stearate of soda was first formed and
the various metallic stearates were precipitated from
a solution of the stearate of soda in hot water. Their
properties were similar to the palmitates before mentioned, but rather more promising on account of stearic
acid being a common material, easily obtained in com-

73
merce. Experiment No. 794 mentions stearate of lead
as a very hard material, in fact too hard to use alone,
and a note is made indicating that it would make a
good hardener for other materials. Experiment No.
795 mentions the production of stearate of aluminum;
No. 799 mentions the production of a compound salt
of stearic and oleic acids and lead, made from the soaps
formed by saponifying equal parts of stearic and oleic
acid and precipitating the same after dissolving in
water by the usual method by lead acetate. It mentions 74
that several pounds were made and cylinders
molded of this combination were thought at the
time to be perfect. However, some difficulties were
met with in this composition and it was not accepted
for regular manufacture.

Q. 30. What is the source and characteristics of stearic acid?

A. The chief sources of stearic acid are lard and tallow.
Its properties are a hard, crystalline, white
solid, insoluble in water, having a melting point some- 75
where around 58 degrees centigrade; as it occurs
in commerce it is mixed with more or less palmitic
acid. In this form it is used largely in the manufacture
of candles and in soap-making.

Q. 31. In connection with Experiment No. 801, I find the date July 25, 1888, and opposite this experiment the same date is repeated with the note:

> "Moved up to Room 14 with Payne, and the
> following experiments were made jointly with 76
> him."

What do these dates and what does this note refer to?

A. The previous experiments were conducted in one of the out buildings of the Laboratory, known as the Chemical Room, and Room 14 was a room on the top floor of the main building where Payne molded cylinders out of different compositions and in order to get more familiar with the operations of molding, Mr. Edison asked me to work together with him.

77

Q. 32. What does the date of July 25, 1888, indicate in your mind?

A. The time of moving, and that all previous mentioned experiments were made prior to that date.

Q. 33. Is the Payne referred to still connected with the Edison Laboratory, or with Mr. Edison, so far as you know?

A. No, he is not. I don't know where he is.

Q. 34. In this same note book, No. 564, opposite
78 Experiment No. 803, the date of which appears to have
been July 27th, 1888, I find a note which I will ask
you to read on the record after which kindly explain
the same?

A. The note is as follows:

> " Standard Solution Lye.
>
> Lewis Lye, dry powdered. Dissolve one
> pound (equivalent of six pounds oleic or stearic
> 79 acid according to old saponification) in suffi-
> cient quantity of H_2O. Filtered and found
> specific gravity at 90 deg. F. to be 1.270. Total
> amount of solution equals 1300 C. C., which was
> taken as the quantity required to produce the
> old degree of saponification of six pounds of
> oleic or stearic acid.
>
> Standard Solution of Pb acetate.
>
> 80 Neutral acetate of lead in H_2O—specific gravity of 1.150 at 86 deg. F."

These standard solutions were made for convenience in forming the different compounds of fatty acids with metallic bases, which were used in subsequent experiments and some prior to this date of July 27, 1888.

Q. 35. By " Standard Solution " am I to understand that you mean a solution of caustic soda of a standard specific gravity?

A. Yes, at that time. The Standard Solution was changed later on.

Q. 36. Please consider the remaining experiments in note book No. 564, from Experiment No. 801 to Experiment No. 830, and in note book No. 565 from No. 831 to Experiment No. 853 inclusive, and explain genearlly what these experiments consisted of?

A. The experiments from 801 to 853 consisted chiefly of making metallic soaps from other sources of fatty acids than stearic and oleic, and combinations of the same with certain amounts of stearic and oleic such as cocoanut oil, palm oil, cotton seed oil and peanut oil. Also, combinations of different metals with the fatty acids. An instance of this kind is No. 836, where a portion of the soap solution is precipitated by a solution of a mixture of lead acetate and magnesium acetate in the proportion of one part of lead and two parts of magnesium. The soap solution mentioned in this experiment is the same as in Experiment No. 834, which is formed from a mixture of cocoanut oil and oleic acid saponified together. The date given for this Experiment No. 834 is August 23, 1888.

Q. 37. Following Experiment No. 853. I observe a note under date of August 31, 1888, which I will ask you to quote on the record, and then explain the same?

A. The note is as follows :—

> "A serious obstacle was here found in all cylinders made of cocoanut oil, palm oil, cotton seed, and in fact all of the oils and fats, in the shape of minute bubbles, which could not be seen by the naked eye, but could be very distinctly heard in the phonograph as a crackling and scratching noise, and could be seen under the microscope. These were found after a series of experiments to be caused by glycerine decomposing slowly while the wax is melted, giving off acrolene and water, also to the vaporization of the glycerine. It was found that glycerine always occurred in the wax unless it was especially well-made and washed with alcohol after precipitating or other processes, which

85

> would make it too expensive for practice. The point at which the bubbles formed could be raised by heating the melted wax very hot and letting it settle and then to the temperature required in molding. But this operation spoiled the quality of the wax and then great care had so be taken to run it high enough each time, and not to let it get too high in molding, which altogether made in impracticable, so the only
> 86 way left was to use fatty acids and not neutral
> fats or oils."

I recollect that the object in trying to use the neutral fats was that they were cheaper than the fatty acids.

Q. 38. Do I understand that this note of August 23, 1888, records your observation that glycerine was found to be objectionable and that, therefore, the employment of neutral fats or oils, notwithstanding their cheapness, was impracticable?

87 A. Yes.

Q. 39. By using fatty acids would this defect be remedied?

A. Yes, provided the fatty acids themselves as obtained in commerce were completely separated from the glycerine, or in other words, provided the fatty acids as obtained in commerce contained no neutral fats.

Q. 40. Am I correct in understanding that in connection with Experiments from experiment No. 739 to
88 experiment 864, the procedure followed by you was to
completely saponify a suitable fatty acid (such as oleic, palmitic or stearic acid) or a suitable neutral fat (such as cotton seed oil or palm oil), by a solution of caustic soda, after which a metallic salt (such as acetate of lead), was introduced to result in the precipitation of the oleate, palmitate, or stearate of the metal employed, or mixtures of the same?

A. Yes, you are.

Q. 41. And as I understand it, under date of August

89 31, 1888, you observed the unfavorable effects in the composition when glycerine was present?

A. Yes, that is correct.

Q. 42. Please refer to experiments No. 855 and 856, and explain what they relate to?

A. Experiment No. 856 referred to in your question represents a departure from the previous practice, in that a stearate of alumina is made without precipitating as heretofore. In this case, stearic acid and chloride of alumina are brought together and heated and 90 the chloride of alumina being added little by little, until the mass becomes thick, even at a high heat. No description is here given of the product, but I distinctly remember its characteristics. It formed a transparent or semi-transparent amorphous mass, having a high melting point and being very thick when molten. On this account it was unfit for making phonograph cylinders, but it was a very interesting product. I remember this distinctly because I was amazed at the time to know that it was possible to drive off or 91 replace a strong mineral acid like hydrochloric by a relatively weak organic acid. Experiment No. 855 refers to another aluminum soap, but in this case the fatty acids with which it is combined were derived from oxidized linseed oil, in the same manner as mentioned in Experiment No. 854.

Q. 43. I will now ask you to read on the record your notes of experiment No. 857, and explain the same?

A. The notes are as follows: 92

" STEARATE OF SODA.

> Made by adding dissolved caustic soda to melted stearic acid. It must be added slowly to the acid, and after some is added the higher stearate formed is allowed to dissolve in the stearic acid, more heat being applied as the melting point of the mass raises or as more soda is combined with the stearic acid.

93

> To 1000 grams of stearic acid
>
> About 100 grams of Na HO (Lewis) was used.
>
> This makes a soap of a light brown color with a very high melting point, which when poured out and cooled becomes amorphous on the cooling surface, but crystalline on the inside. It is almost perfection on the phonograph (the amorphous outside) as far as articulation, cut
> 94 and scratch are concerned, but when the cooling surface has been cut through it becomes scratchy and no good, also will absorb moisture on hot damp days, which would spoil any record put on it."

This composition is different from other soda soaps previously made in that it is an anhydrous soap, in which the saponification was carried to a point somewhat lower than complete saponification. I should
95 say roughly, that the saponification was carried to a point of about 70 per cent. of the complete saponification. Had it been carried to complete saponification, it would have been impossible to have melted the product without charring or burning. The product as obtained gave great promise because of fine record making qualities, which the material possessed, but it had this objection that it was very crystalline and it was only with great care that enough amorphous surface could be obtained to take the record on in order
96 to test. I remember however, that this material was far more easily molded than previous compositions, and that if these difficulties could be obviated, (I refer to the crystalline properties) that it might make a very promising material.

Adjourned to Tuesday, December 19th, 1905, at 10.15 A. M.

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ORANGE, N. J., December 19, 1905.

Met pursuant to adjournment.

Present—Counsel as before.

EXAMINATION OF MR. AYLSWORTH CONTINUED.

Q. 44. Kindly explain what is meant in your last answer by "other soda soaps previously made?"

98 A. In the soaps of soda before mentioned it was the practice to saponify in the presence of water so that the temperature never exceeded the boiling point of water. This temperature not being sufficient to melt the soap, there always resulted a hydrated soap; this hydrated soap being used as an intermediate step for the production of other metallic soap, such as stearate of lead and oleate of lead. It was advantageous to leave them in a hydrated state, because as such they were more easily dissolved in water.

99 Q. 45. With your previous experiments preceding experiment No. 857, what would have been the effect if the water had been completely driven off?

A. The soap formed would have dried up into an infusible mass, or at least not fusible excepting at a very high temperature, so high that the material would be more or less charred before getting into a fluid condition.

Q. 46. How was this difficulty remedied by the procedure of experiment No. 857?

100 A. In that case the soda was added in small quantities at a time, and the water practically all driven off after each successive addition was made, and the operation of adding the soda stopped before enough had been added to completely saponify the stearic acid, which left the material with a certain percentage of free stearic acid. In the presence of this free stearic acid the melting point of the material is sufficiently low to allow it to become fluid suitable for pouring into a mold without charring or burning.

Q. 47. Please refer now to experiment No. 858 in

101
note book No. 565, quote the same on the record and explain the purpose of the same?

A. The experiment is as follows:

> "Stearic acid------------------------ 500 parts
> Na HO (Lewis)-------- 37 parts } Dissolved in
> Acetate of Alumina (*sic.*) 18 parts } H_2O together.
>
> The object of this experiment is to take the
> 102 crystallization out of the stearate of soda and
> to make it mold better.
>
> It came out bang-up, non-crystalline, good cut, molded first-class but was electrical. Not so likely to absorb moisture."

Where it is stated that the object of this experiment
was to take the crystallization out of the stearate of
soda, it refers to the difficulty encountered in the pre-
vious experiment No. 857. I had observed that stear-
103 ate of alumina was extremely amorphous and it oc-
curred to me that it might reduce this crystallizing
tendency, which it did. Where I refer to the material
being electrical, I mean that the shavings when the
wax is cut, become charged with static electricity and
are attracted to the cylinder and stylus and diaphragm,
making it rather difficult to remove them. On account
of stearate of alumina being insoluble in water and the
free stearic acid being insoluble in water, it was
thought that this composition would not be so likely
104 to absorb moisture. This composition was the start-
ing point or foundation for the composition which was
finally accepted and put in use.

Q. 48. In your last answer you refer to stearate of alumina. Do I understand that in experiment No. 858 stearate of alumina was used?

A. In making this composition, experiment No. 858, the stearate of alumina was not added as such, but was formed simultaneously with the stearate of soda. The reactions which take place on mixing the caustic soda and the acetate of alumina together with water,

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105 produce acetate of soda and aluminate of soda. Then when this solution is added to the melted stearic acid, the aluminate of soda is decomposed and stearate of soda and stearate of alumina are formed and dissolve in the excess of stearic acid. The acetate of soda which is contained in this solution is also decomposed, liberating acetic acid, which is volatile and carried away by the steam formed, leaving the stearate of soda as the only product remaining due to the reaction of acetate of soda with the stearic acid. 106 In the formula given the Na HO (Lewis) is caustic soda. The acetate of Al (sic.) means acetate of alumina dry, "sic" meaning siccated. That there is reaction between the caustic soda and acetate of alumina is evident by the heat which is developed when the two are mixed in the solution. It is also well known in chemistry that caustic soda will replace alumina from any acid with which it may be combined. In this case, there being more than enough caustic soda than would be necessary to combine with the acetic acid, aluminate of soda results. 107 Had there been an insufficient quantity of caustic soda to form aluminate of soda, there would have resulted a precipitate of hydrate of alumina.

Q. 49. Do I undertand that previous to experiment No. 858, you had made stearate of alumina and observed its amorphous properties?

A. Stearate of alumina I had made before and observed its properties. From instances on record in my note book (experiment No. 795 and experiment No. 856), 108 I recollect that the first experiment in which stearate of soda and stearate of alumina were combined together was made by taking some of the stearate of soda of experiment No. 857 and adding stearate of alumina in different proportions, taking out a small sample after each addition and noting its property. This was a rough qualitative experiment and no weights or measures made, and for that reason it was not recorded as an experiment in the note book. This was my practice usually in experimenting and served as a

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109 guide in forming the compositions where weights were recorded.

Q. 50. Do I understand that the unrecorded experiment which you have just referred to where you combined stearate of alumina as such with stearate of soda as such, was made before experiment No. 858 ?

A. Yes.

Q. 51. Can you explain in what way the presence of stearate of alumina, either added as such to the stea-
110 rate of soda, or formed chemically, as a concurrent reaction with the formation of stearate of soda, tends to correct the tendency to crystallization in the stearate of soda, which you observed in connection with experiment No. 858 ?

A. I believe it to be due to a physical state which it produces in the mixture, stearate of alumina being very colloidial or non-crystalline, and when dissolved in a solvent it is very viscid. As a general thing a crystalline composition mixed with an amorphous or
111 colloidial composition results in a less crystalline material than the crystallizable material. I recollect that in the earlier experiments, where different natural waxes were mixed together and wax-like materials, that these mixtures when made of a crystallizable material like stearic acid, were changed in respect to their crystalline nature by mixing them with an amorphous material. Instances of this are experiments No. 396 in book No. 564, where gum dammar is mixed with stearic acid in proportion of 100 parts stearic acid to
112 ten parts gum dammar ; also No. 397, No. 398 and No. 399, where paraffine is mixed with stearic acid.

Q 52. Kindly consider your experiments in Note book No. 565, from experiment No. 859 to 866 inclusive and explain briefly their general character ?

A. In the experiments referred to in your question No. 859 is one in which stearate of magnesia is mixed with stearate of soda, in order to try its effect on the crystalline nature of stearate of soda. In this experiment the stearate of magnesia was made by adding acetate of magnesia to fused stearic acid, until a trans-

113 parent amorphous mass is obtained, which has a slightly brownish yellow color. The experiment states that one-third stearate of magnesia was used and two-thirds stearate of soda, No. 857. The note in the experiment states that "this makes a wax with a very good cut, non-electric but had too high a melting point to be practical." The next experiment No. 860, relates to the formation of barium stearate by the addition of 100 grams of barium acetate to 1000 grams of stearic acid. The two are fused together by which operation acetic 114 acid is driven off and barium stearate results. The note in the experiment states that this "forms a hard high melting point amorphous solid, which has a poor cut."

The next experiment No. 860½ refers to an admixture of No. 860 with free stearic acid. That is to say barium stearate.

The next experiment No. 861, refers to a mixture of No. 860, that is barium stearate, with No. 857, (soda stearate) in various proportions, with the note : "none 115 of which were as good as No. 858", that is to say the mixture of stearate of soda and stearate of alumina.

The next experiment No. 862 relates to the formation of "stearate of strontium, made same as No. 860, which it much resembled."

The next experiment No. 863 relates to "stearate of strontium mixed with No. 857 (that is, stearate of soda) in various proportions. Good but not equal to No. 858", which is the stearate of soda and stearate of alumina composition. The next experiment, No. 864, 116 refers to the production of stearate of alumina, wherein not sufficient alumina was added to make the normal stearate of alumina; in other words, a mixture of stearate of alumina with stearic acid.

"Stearate of Alumina (White).

> To fused stearic acid, acetate of alumina is added until a white hard non-crystalline cohesive to cut, wax is obtained. It forms a liquid

66

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> about as thick as No. 857, which solidifies at very low temperature, in fact it can be poured in the hand and left to cool, but when once solid its melting point is very much higher.
>
> Molds good, is insoluble, talks good, cuts good, contracts scarcely any in mold, less scratch than No. 857, very electrical."

The above is quoted from note book No. 565.

118 At the time this composition was made it appeared to be very good, but later on imperfections were found in it, as indicated by a note on the opposite page, as follows:

> " It was afterward found that No. 864 changed on surface after standing awhile, becoming porus. It is really a mixture of or compound of stearate of alumina and acetic acid, the latter of which evaporates; when No. 864 is
> 119 heated very hot, it loses its white waxy appearance and becomes distinctly crystalline. This has a remarkable contraction when cooled in a sauce pan."

This material is not pure stearate of alumina, but rather a mixture of stearate of alumina with a very considerable excess of stearic acid. I recollect the contraction noted in the above quotation, as it was very remarkable. Instead of cooling with a smooth
120 surface, the material drew up into hills and hollows; the highest points being, I should say, three-eighths or a half an inch above the average level, and this wrinkled surface produced a curious appearance.

Experiment No. 865 refers to "stearate of lead mixed with various proportions of stearate of alumina, none of them equalled No. 858 ", which was the mixture of stearate of soda and stearate of alumina.

No. 866 refers to " Stearo Sulphurett of soda, made same as No. 857, except hydrosulphurett of soda (NaSO) is used in place of Na HO. This gives very

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good wax which is very similar to No. 1, and if anything better. But No. 858 is better and more practical."

"No. 1" referred to in the above, is the same as No. 857, as will be seen in note book No. 533, from which this was copied.

Q. 53. As I understand the purpose of experiments
Nos. 859 to 866, you were seeking by the addition of
various metallic stearates to the compound, to correct
the crystalline tendency of stearate of soda, but that 122
for various reasons, none of these experiments were so
successful as experiment No. 858 in which stearate of
alumina was employed for this purpose; is this correct?

A. It is.

Q. 54. Please consider experiment No. 867, quote the same on the record and explain the same?

A. The experiment is as follows:—

"No. 867. 123

Stearic acid	1200 grams,
Lewis' Lye (Comc)	900 grams,
Acetate of alumina (sic)	433 grams,"

I notice that "1200" grams as written in this note book is a mistake and should read—12000 grams. It reads 12000 grams in note book No. 533, from which this experiment was copied.

The notes continue— 124

> "Acetate of alumina and Lewis' Lye are dissolved together in water, so as to make a concentrated solution.
>
> The stearic acid is melted in iron kettle aad heated to 240 degrees F., then the solution is added same as in No. 357, the temperature ranging between 240 degrees to start and 380 degrees at finish. This is cooked a day and a half, or until bubbles stop coming. This is in-

> 125 tended as a duplicate of No. 858, except a little more soda and alumina is added.
>
> Came out same as No. 858, except a little better. It was a reddish color, due to iron kettle.
>
> This material when cooked at a high temperature (400 degrees F.) is much improved, but is rendered less easily molded, on account of the melting point rising.
>
> 126 This wax seems all right, except if a very deep track is made by the phono needle, it chips out, seems to be a little to much Al in it."

From this experiment it is obvious that I had concluded that the combination with stearate of soda and stearate of alumina, No. 858, was the best, and here I was trying to duplicate the same on a larger scale, with slight variations in proportions of ingredients. In other words, in experiment No. 867 the
127 proportion of caustic soda and of acetate of alumina was slightly more than in experiment No. 858. In this experiment the operations were done under different conditions of temperature, the temperature in this case being mentioned, while in No. 858, no note was taken of the temperature. At the end of the quotation where "too much Al in it" is referred to, I mean by "Al," aluminum, this being an abbreviation for aluminum.

Q. 55. Experiment No. 868 appears to also relate to a composition in which stearate of soda, and stearate
128 of alumina are used, and if this is so, explain the relative proportions of this experiment as compared to No. 858?

A. No. 868 has more soda in proportion and the same relative amount of alumina compared with stearic acid as No. 858.

Q. 56. Please refer to experiment No. 869 and explain the same?

A. This experiment consists in taking No. 867 and adding a little more lye and stearic acid for the purpose of decreasing the relative amount of stearate of

129

alumina in the composition. It is noted under this experiment that "This is much better and only remains to get correct proportions to make it O. K."

Q. 57. Please refer to experiment No. 870 and explain the same?

A. This experiment refers to heating No. 867 to a higher degree of heat than was used in that experiment, with the note "somewhat improved."

Q. 58. What do experiments No. 871 to No. 876, inclusive, relate to? 130

A. No. 871 was an experiment where No. 867 composition was admixed with an additional quantity of stearic acid and caustic soda. The proportions are given as follows:

"No. 867	300 grams
Stearic acid	50 grams
Caustic soda	5 grams"

The note states that "This is very good in all respects and when filtered, is perfection almost." 131

Experiment No. 873 is similar to No. 871; No. 874 is marked the third duplicate of No. 871; No. 875 relates to the fourth duplicate of No. 871 and in this case attempt was made to standardize the solution of caustic soda and acetate of alumina, as follows:—

> "Caustic soda and acetate of alumina dissolved in water same as No. 867, this is filtered and when measured out equals 2370 cubic 132
> centimeters of 1.380 specific gravity at 80 degrees F."

No. 876 relates to an experiment where No. 871 composition is heated to 363 degrees F. and then filtered through filter paper in oven. The note remarks that—"Filters very slow, about a drop in two seconds or less. Makes perfect cylinder when filtered."

Q. 59. Am I correct in assuming that at the time experiments last referred to were made, you considered

133 the composition of experiment No. 871 to have the best proportions for the purpose?

A. You are.

Q. 60. Please indicate on the record the relative proportions of the separate ingredients employed in experiment No. 871?

A. The proportions were as follows:—

	Stearic acid	14000	grams,
134	Caustic soda	1100	"
	Acetate of alumina	433	"

Q. 61. Having selected the composition of experiment No. 871, as a desirable one, what was then done experimentally?

A. Having settled on this composition as being all
right, experiments were made on molding and filtering
the material. These experiments were made with the
object of finding the best conditions of temperature of
135 the wax, core and mold; also, with various forms of
caps for the molds and by chilling the mold by water-
jackets, after the wax was poured in; also, winding
the core of the mold with string, silk thread and
paper strips, with the object of reinforcing the cylin-
der; also, pouring the very hot wax in a cold mold,
in order to allow the bubbles to rise to the top.
The experiments on filtering were made with the
object of eliminating crackling noises in the record
when made, caused by foreign impurities in the wax.
136 Among these experiments on molding is an experiment
No. 892 which is one of the best proportions for mak-
ing the wax at that time. It reads as follows:

> "To 14000 grams of stearic acid, use 2370 cubic centimeters of standard solution of lye (see opposite)."

The Standard Solution of lye referred to on opposite page is as follows:

137

" STANDARD SOLUTION OF LYE AND ALUMINUM ACETATE.

> Lewis' lye 1100 grams, Acetate of alumina dry 440 grams, Dissolved in enough water to make sp. gv. equal 1.3800 at 80 degrees F. after filtering."

Q. 62. In making the Standard Solution of caustic soda and alumina acetate, above referred to, what re- 138
actions would take place ?

A. Aluminate of soda would be formed by mixing the caustic soda with acetate of alumina in the solution ; the solution would then consist of free caustic soda, aluminate of soda and acetate of soda.

Q. 63. When such a solution is added to stearic acid and heated from 240 degrees to 400 degrees F., as stated in experiment No. 867, (on which the compositions of No. 871 and No. 892 are based) what becomes
of the acetate of soda ? 139

A. The acetate of soda is decomposed by the hot stearic acid in the same manner as aluminate of soda, but with this difference : The acetic acid of the acetate of soda being volatile, is driven off, leaving the stearate of soda in the composition. In the case of aluminate of soda combining with stearic acid, the alumina being the acid, it is replaced by stearic acid forming stearate of soda, but the alumina not being volatile and being a base in itself, combines with the stearic acid,
forming stearate of alumina. 140

Q. 64. What do experiments from 913 to 952 inclusive relate to ?

A. They all refer to reducing the electrification of the composition as developed when the material is shaved or turned. That is to say, when the record is shaved off for the purpose of presenting a smooth surface to receive a new record. These experiments were made by mixing small proportions of various substances with No. 871. These experiments were not successful in removing the difficulty, which was

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141 finally overcome by Mr. Edison adopting an addition on the cutting knife of the phonograph in the shape of a metallic trough or chute, which collected the shavings as fast as they were formed and conducted them into a receptacle provided for them.

Q. 65. In connection with experiment No. 953, I observe the date of December 6th, 1888 ; what does this date indicate ?

142 A. The date on which the experiments were made.

Q. 66. What relation, if any, has this date on the experiments up to No. 952, that you have so far considered ?

A. It represents the date when the experiments were considered concluded on the composition and experiments started on other lines. For instance, experiments No. 953, 954 and 955 relate to various schemes for applying a thin tough film to the record surface.

143 Q. 67. Please refer to experiment No. 956 and explain what it relates to, quoting the same on the record ?

A. I find that by referring to experiment No. 952 in note book No. 565, that a note is made as follows :

> " No. 871 is adopted as regular and lot made in the Phonograph Works.
> 63425 grams of stearic acid
> 15000-$\frac{1}{2}$ cubic centimeters of Standard Solu-
> 144 tion.
> Came out O. K. but was pinkish from the iron of kettle."

This lot was made previous to December 6th 1888, as that is the date given for No. 953 the succeeding experiment.

Referring now to experiment No. 956, is it as follows :

> " Trouble was found in working No. 871 in Phonograph Works, as it would not turn smooth

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> with the knifes we had, and when they did get a good knife it would not keep in good condition long, making it impractical to work; so the following experiments were made to soften No. 871 a little:
>
> 2000 grams of stearic
> 200 grams of red oil
> 500 cu. centimeters of Stand. Solution."

The knifes referred to in this experiment were the 146
steel turning off knifes mounted on the phonograph; they subsequently used sapphire in place of these steel knifes for the purpose of making them wear better. The red oil referred to in this experiment is the commercial name for oleic acid.

Q. 68. What do you refer to in experiments No. 952 and No. 956 as "Phonograph Works"?

A. The factory at that time which was erected for the manufacture of phonographs.

Q. 69. What facilities did the Phonograph Works 147
have in December 1888 for making these wax compositions?

> Objected to as incompetent, irrelevant and immaterial.

A. They had a room in the main building, (one of
the main buildings) where a number of iron pots were
arranged in brick-work and heated by gas burners.
This plant was equipped for the purpose of making the 148
old composition of wax using ceresin and carnauba,
but as I recollect now, the old composition was not
manufactured here, this being done in limited amounts
at the old phonograph factory in Bloomfield and at
the Laboratory at Orange.

Q. 70. Do I understand that during the time that you were making experiments that you have so far considered the Phonograph Works were still using the old carnauba-ceresin composition?

A. Yes.

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Q. 71. Kindly refer in note book No. 533 to the original note from which No. 952 was copied in note book No. 565.

A. Referring to note book No. 533, the original note in this book is numbered 101; also, the new serial number 952 corresponding with the book No. 565; the note which is the original one, reads as follows:

> 150 "Done in Wax Room—Phonograph factory 63425 grams stearic acid (140 lbs.) Stand. Solution--15063⅓ cu. Centimeters. Good".

On the opposite page the following is noted:—

> "Took 55 hours from starting to finish."

151 I notice in this book, No. 533, that the three following numbers after No. 101 relate to lots also made in the Phonograph Works on a large scale, they being duplicates of the lot No. 101, otherwise numbered 952, with the exception of small changes in the amount of Standard Solution used. These lots were 150 lb. lots, except No. 101 which was 140 lbs.

Q. 72. Please refer now to experiment No. 957, and explain the purpose of the same and the results secured?

A. Experiment No. 957 relates to the following composition:—

152

"Stearic acid	3000 grams,
Red Oil	150 grams,
Standard Solution	750 grams."

A note on the opposite page refers to this experiment as follows:—

> "This made everything O. K. and was accepted by Mr. Edison as regular, for the time being, or until something better turned up."

153

Q. 73. Please state on the record the different proportions of ingredients of the composition of experiment No. 957 ?

A.

Stearic acid	3000 grams,
Red Oil	150 "
Caustic soda	252 grams,
Acetate of alumina	100.5 grams.

Adjourned to Wednesday, December 20th, 1905, 10 A. M. 154

ORANGE, N. J., December 20, 1905.

Met pursuant to adjournment.

Present : Counsel as before.

EXAMINATION OF MR. AYLSWORTH CONTINUED.

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Q. 74. Having reference still to your note book No. 565, I observe that experiments from No. 958 to No. 1015 inclusive are referred to as "Improving No. 871." Kindly refer generally to these experiments, point out the objects you had in mind, and explain, if you have any recollection on the point, the results obtained.

A. These experiments relate to endeavors to improve No. 871 and they are made by mixing various substances with No. 871 as a base. From the nature of the experiments, I think that the object was chiefly to 156 toughen or render the wax less breakable.

Q. 75. Do I understand that as a result of any of the experiments between No. 958 and No. 1015 any change was made in No. 957, which you say was accepted by Mr. Edison "as regular for the time being."

A. No, during this period, that is, while these experiments referred to were being made, the composition corresponding to the formula of No. 957, continued to be manufactured in the Phonograph Works and was known as "regular."

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157 Q. 76. Referring to your answer to Q. 71 regarding lots No. 102, 103, and 104 in Note book No. 533, I find certain dates and hours mentioned, which I wish you would kindly explain?

A. The dates mentioned refer to the dates when the composition numbered 102, 103 and 104 in note book No. 533 were made. These dates give the time, the day and the month. Opposite No. 102 is stated "10 o'clock Friday." Opposite No. 103 the time is
158 stated as "7 A. M. Monday, February 4th." No. 104 is marked "started 10:30 February 4th P. M." In each case the time given represents when the batch was started. The year I know to be 1889.

Q. 77. Having reference to experiment No. 1022 I find the date May 30th, 1889; what does this date indicate?

A. This date indicates the date on which experiment N0. 1022 was made. The previous experiments in book No. 565 were all made previous to this date.

159 Q. 78. I will ask you now to refer to experiments No. 1026 and No. 1027, quote the same on the record, and explain the reason for these experiments?

A. These experiments are as follows :—

> "No. 1026—PREVENTING REGULAR FROM BEING SOLUBLE IN MOISTURE.
>
> 160 It was found that cylinders made from Regular (No. 957) were attacked by moisture of the air. This was a very serious matter as records on cylinders became spoiled and the cylinders that were sent out made of this material had to be called back. At the time No. 957 was introduced it was cool weather and they were not affected, but when the hot moist summer weather came, cylinders exposed to it, were badly corroded on the surface."
>
> "No. 1027—Oleic Acid, or rather the oleate of soda formed in the wax was found to be the cause of wax being affected by moisture."

161

These deductions were arrived at after experiments had been made, which I recollect as consisting of placing a turned blank in a box where it became exposed to a moist atmosphere and an increased temperature over the normal temperature of the room. Also, from the knowledge I had of the property of oleate of soda being very soluble in water. I remember that at the time the composition having oleic acid in it was made, that I feared that this effect might take place, but a rough test made at the time seemed to indicate that 162
the composition was all right. The rough test referred to was pouring cold water over the material in the form of a cylinder, which had no apparent effect. I concluded then that my fears were groundless and that the excess of stearic acid in the composition prevented the effect from taking place.

The No. 1027 referred to above is a continuation of No. 1026; the No. 1027 following this continuation applies to the succeeding experiment, which is as follows :— 163

> " *No. 1027* :
>
> The stearic acid we were getting at the time was found not to be as good as that bargained for; it contains oleic in considerable quantities; samples were obtained from Mitchell & Co. which were very hard and free from oleic.
>
> No. 871 (made from Mitchell's) 100
> Ceresin 5 "

This experiment was made with a view of overcom- 164
ing the before mentioned difficulty. I was familiar with the nature of ceresin and knew that it was a moisture proof wax incapable of combining with caustic soda to form a soap. Therefore, it occurred to me that this material might replace the oleic acid previously used as a softener and at the same time improve the material as regards its being affected by moisture.

Q. 79. Referring to experiment No. 1026, what do you mean by the statement that "the cylinders that were sent out made of this material had to be called back"?

165 A. The cylinders were manufactured and shipped from the Phonograph Works, and when the bad effects were noticed these cylinders were recalled to prevent losses occurring due to making records on them. I remember that many records were made on these cylinders in the Laboratory at Orange, where musical records were manufactured for sometime, and that these records were damaged from this effect. My
memory on this point is very clear because I felt very
166 much discouraged to think that we had gone so far before
finding the difficulty; in fact, I saw visions of losing my job.

Q. 80. Please explain the injurious effects that were due to the presence in the composition of a considerable quantity of oleic acid?

A. The surface of the record became dull and etched or rough, so that it was almost impossible to hear the record on account of the noise which this roughened
surface made. I recall that the effect was also
167 complicated by a mildewed appearance, which on investigation
was found to be a deposit which could be rubbed off. These records sometimes were affected in this way, and sometimes by the roughened surface as before stated, and sometimes by both.

Q. 81. What was the reason for the mildewed effect which you have referred to?

A. It was due to the acetic acid not being completely driven off in some cases from the wax.

Q. 82. When were the observations made that you
168 have set forth in experiment No. 1026?

A. Between May 30th, 1889, the date of experiment No. 1022, and August 14th, 1889, the date of experiment No. 1055.

Q. 83. Do I understand from experiment No. 1026 that it is strictly necessary in making a suitable phonograph composition to entirely eliminate oleic acid? That is to say to have no oleic acid present in the composition.

A. It is not necessary to entirely eliminate the oleic acid, which I know to be the case because the compositions which have been manufactured since from

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commercial stearic acid were successful and they contained a small percentage of oleic acid, namely, from 2 to 5 per cent, which is always present in stearic acid obtained in commerce.

Q. 84. Please refer briefly to experiments No. 1028 and 1029 and explain the same ?

A. The experiments numbered 1028 and 1029 relate to a continuation of the idea mentioned in No. 1027 and differ from No. 1027 only in respect to the percentage of ceresin, which in No. 1028 to No. 1029 is 170 increased in successive increments of 5, 10 and 10. No. 1029 as recorded is duplicated, which is evidently a mistake in writing down the number, as there are three distinct experiments mentioned as No. 1028 and No. 1029. On the opposite page to No. 1029 is a reference to the same which is as follows :—

> " This is O. K. Absolutely not affected by moisture ; can be soaked over night in water without showing it ; talks even better than old 171 Regular and makes an excellent musical cylinder. Molds O. K. and at lower temperature. Accepted by Mr. Edison as regular."

No 1029 adopted.

Q. 85. Please consider experiments from No. 1030 to No. 1051 and explain the same ?

A. These experiments relate to improvements in the method of making the wax and are devoted to finding the correct proportions after the said improvement was made. Also, some further experiments where an attempt is made to give the wax some additional improvement in its sound recording properties. Experiment 172 No. 1030 reads as follows :—

> " The idea of this experiment is to see if we can't do away with the expensive acetate of alumina.
>
> Mitchell's stearic acid---------- 1000 grams
> Lewis' Lye------------------- 170 "
>
> precipitated by alum washed and dried."

Use of alum

80

173

This experiment was to try to get another source of alumina to use in making the wax which in this case is stearate of alumina. The product obtained in this experiment was a white powder, when dried. This material was manufactured on a large scale, shortly after this experiment was made.

No. 1031 refers to the production of incompletely saponified stearate of soda. The experiment reads as follows :—

174

> " Mitchell's stearic acid............. 500
> Lewis' Lye.......................... 40 "

No. 1030 where 1000 grams of stearic acid is saponified by 170 grams of Lewis' Lye represents complete saponification, but No. 1031 where the proportions are 500 stearic to 40 Lewis' Lye represents something under 50 per cent of complete saponification.

No. 1032 and No. 1033 are experiments wherein in-
175 completely saponified stearate of soda (No. 1031) is mixed and melted with (No. 1030) stearate of alumina in slightly different proportions. The note opposite to No. 1030 in book No. 565 read as follows :—

> " Plant having 500 lbs. per day capacity was started for making No. 1030."

This note was made opposite No. 1030 on account of indicating for purposes of record that No. 1030 was the
176 material, or rather the formula, used to make the stearate of alumina. Other compositions for making the wax were tried after experiment No. 1033. No. 1034 relates to making the incompletely saponified stearate of soda similar to No. 1031, excepting the proportion of soda in relation to the stearic acid is slightly increased. The following experiments, Nos. 1035 and 1036, relate to admixtures of stearate of soda (No. 1034) and stearate of alumina (No. 1030). The attempt in these experiments was to duplicate the wax which had been previously made using acetate of

177 alumina. A note opposite to No. 1036 states the following :—

> " This duplicates No. 871. (made from Mitchell's stearic acid) except no acetate is used in it ; makes quicker and easier."

[illegible]

No. 1037, relates to still another incompletely saponified stearate of soda, similar to No. 1034, excepting more alkali in proportion to the stearic acid is used in 178
No. 1037 than in No. 1034.

The next two experiments, Nos. 1038 and 1039 are compositions in which No. 1037 is used in combination with slightly different proportions of stearate of alumina, No. 1030.

No. 1040 is another composition of stearate of soda, wherein the soda is in less proportion in relation to the stearic acid than in either No. 1037, No. 1034 or No. 1031. The proportion given in this case being " stearic acid–500, Lewis' Lye–35." 179

The next two experiments Nos. 1041 and 1042 relate to admixtures of this stearate of soda No. 1040 with stearate of alumina No. 1030, as before.

No. 1043 is an experiment in which stearate of soda (No. 1034) is combined with stearate of alumina (No. 1030) and ceresin. Nos. 1044 to 1047 inclusive are similar except in No. 1044 paraffine is used in the composition and in No. 1045, white wax, meaning bees' wax, is used, and in No. 1046 ceresin is used in greater amounts, and in No. 1047 ceresin is also used in less 180
amount than in No. 1046. The formula given for No. 1046 is :—

" No. 1034 (stearate of soda)	100
No. 1030 (stearate of alumina)	15
Ceresin	30 "

Opposite No. 1046 in the following note :—

> " This is an exact duplicate of Regular (No. 1029) and is much cheaper and easier to make. The acetate of alumina being done away with. Accepted by Mr. Edison."

[illegible] of alum process

82

181

In all of these experiments the object was to arrive at a similar composition to No. 1029 in a different way. It was more easy for me at that time to arrive at a duplicate of No. 1029 made in a different way by experiment than by calculation. No. 1048 is an experiment wherein a wax composition has been made substituting chemically pure caustic soda in place of the commercial article, which had previously been used.

The next three experiments relate to admixtures of
182 1048 with small percentages of resin gums. The object was probably to impart a little more toughness to the wax.

Q. 86. Referring now to No. 1030 is it a fact that 170 grams of Lewis' Lye (commercial caustic soda) will saponify 1000 grams of stearic acid (Mitchell's)?

A. Yes, it will about completely saponify 1000 grams of stearic acid, to make the normal stearate of soda. This amount of caustic soda in relation to stearic acid is somewhat higher than theory required
183 for the complete saponification of pure stearic acid by pure caustic soda, the reason for this being on the one hand, the stearic acid of commerce consists of about 50 per cent palmitic acid, which requires more soda to completely saponify it than does stearic acid. On the other hand, the caustic soda of commerce and especially the form of caustic soda that we then used, contained something like 10 to 20 per cent of water and carbonic acid, which required a somewhat greater weight where this material is used over what would be
184 necessary were absolutely pure or theoretically pure caustic soda used.

Q. 87. Have you calculated the amount of chemically pure caustic soda required to completely saponify 1000 grams of pure stearic acid?

A. I have, the amount required by calculation is 140 grams of caustic soda to 1000 grams of pure stearic acid.

Q. 88. And how much chemically pure caustic soda would be required to completely saponify 1000 grams of pure palmitic acid?

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185 A. 156 grams.

Q. 89. So that if commercial stearic acid contains 50 per cent palmitic acid, it would require about 148 grams of commercially pure caustic soda to completely saponify 1000 grams of such a mixture ?

A. That is correct.

Q. 90. What is alum, and what reactions take place in experiment No. 1030 ?

A. Alum is a soluble salt containing alumina in com-
bination with sulphuric acid and a sulphate of an alkali ; 186
usually the alkali is ammonia, potash or soda. Alum belongs to a class of inorganic salts, known as double salts, where a sulphate of one metal is combined with a sulphate of an alkaline metal, the two forming a compound substance which is usually separated from the solution in crystalline form.

In experiment No. 1030 referred to, the reactions which take place are as follows :

Completely saponified stearate of soda in the form
of a solution in water is caused to react with a solution 187
of alum by simply mixing the two solutions in such quantities that there is a slight excess of the solution of alum. This results in a precipitate being formed, which precipitate is insoluble stearate of alumina. The other product of the reaction is soluble sulphate of soda, which remains in the solution and is separated from the filtration and washing the precipitate.

Q. 91. Do I understand that this method (experi-
ment No. 1030) of making stearate of alumina by com- 188
bining with the stearate of soda an alum solution, was a cheaper and more expeditious process than when acetate of alumina was used, as in your previous experiments ?

A. When the stearate of alumina was used in place of the acetate of alumina, there was a considerable cheapening of the product, and also one of the difficulties which we occasionally met with in making the wax was avoided. The difficulty referred to was that which was caused by the difficulty of removing the

84

189 acetic acid entirely from the wax, which caused mildew effects.

Q. 92. Do I understand from the above answer that when acetate of alumina was used, you did not obtain stearate of alumina as an intermediate product?

A. When acetate of alumina was used, stearate of alumina is formed in the wax and the resulting wax composition when stearate of alumina was separately made and introduced is the same thing.

190 Q. 93. Am I to understand from this that the same product is obtained by different processes, one consisting in forming the stearate of alumina separately, and the other consisting in forming the stearate of alumina as a part of the mixing operation?

A. Yes, in the one case, the stearate of alumina is made up separately and mixed with the stearate of soda and in the other case the stearate of alumina is made simultaneously with the stearate of soda.

Q. 94. Am I correct in understanding that experiments from 1032 to 1042 inclusive (except Nos. 1034, 191 1037 and 1040) relate to operations in which separately formed stearate of soda as such was combined in varying proportions with separately formed stearate of alumina as such?

A. Yes.

Q. 95. What is the effect of adding the varying proportions of caustic soda to stearic acid (Mitchell's) set forth in experiments numbered 1031, 1034, 1037 and 1040?

192 A. The effect is to produce varying degrees of saponification, all of them being less than complete saponification.

Q. 96. What proportion of saponification will be secured by adding 36 parts caustic soda to 400 parts stearic acid (Mitchell's) as set forth in experiment No. 1034?

A. Comparing the amount of caustic soda which it was found in practice to be necessary to completely saponify the stearic acid used in experiment No. 1030 with the experiment No. 1034, which you have just

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cited, No. 1034 is 53 per cent of complete saponification.

Q. 97. When stearic acid is partly saponified to form stearate of soda, what becomes of the stearic acid in excess of that combining with the soda?

A. It remains admixed or possibly combined in an unstable form as an acid stearate of soda.

Q. 98. And I understand your testimony to be that this partial saponification of the stearic acid is performed in order to produce a material that can be 194 melted without charring?

A. It is.

Q. 99. Do I understand that in connection with the composition set forth in experiment No. 1046, which you say was accepted by Mr. Edison, the commercial manufacture consisted in separately forming the stearate of soda with its proportion of uncombined stearic acid, and separately forming the stearate of alumina and mixing the two together with the correct proportion of ceresin? 195

A. Yes, that is correct.

Q. 100. Describe this process as it was actually carried out at that time?

A. Stearic acid was completely saponified by making it in a steamjacketed kettle with a solution of caustic soda. After the reaction had taken place the resulting soap was dissolved in a large wooden tank in water. After complete solution, a solution of alum was run into the stearate of soda solution and the mixed solutions 196 constantly stirred until the required amount of alum solution was added. Then the material was filtered and washed with water whereby the stearate of alumina precipitate was separated from the waste products of the reaction. After washing, the stearate of alumina was dried in shallow pans in a steam-heated oven. When dried completely the material was put up in bags and marked "No. 1 Powder". In this condition it was ready to be mixed with stearate of

197 soda, (containing an excess of stearic acid) and ceresin as follows :

A weighed quantity of stearic acid was melted in a
kettle and filtered into another kettle. To this stearic
acid was added a definite quantity of caustic soda solu-
tion sufficient to produce a degree of saponification
somewhere about 50 per cent of complete saponifica-
tion. This was accomplished by carefully adding the
caustic soda in small quantities at a time and gradually
198 allowing the temperature of the mixture to increase.
At the end of the operation the temperature was
usually between 300 and 400 degrees F. Then to this
material or composition, was added the required
amount of No. 1 powder (stearate of alumina) and
ceresin. The temperature was then allowed to remain
at a high degree somewhere between 400 and 450 F.,
or as high as it could be carried with safety. That is,
without catching on fire. It was maintained at this
high temperature long enough to completely foam off.
199 or rather until bubbles stopped coming and the ma-
terial assumed a more or less tranquil state. The
ceresin was generally added toward the end of the
operation.

Q. 101. When was the process which you have described above, carried out commercially, if at all ?

A. It is my recollection that there were only a few batches of wax made in the factory in exactly the manner mentioned in the previous answer, and they were made previous to August 14th, 1889.

200 Q. 102. Kindly put on the record a statement giving the proportion of ingredients defined in experiment No. 1046 ?

A. Stearic acid (Mitchell's)	93.5	grams
Caustic soda (equivalent to 6.5 Na_2O)	8.4	"
Stearate of alumina	15	"
Ceresin	30	"

Q. 103. Kindly refer to experiments No. 1055 to 1059½ and explain the same ?

201 Under date of August 14th, 1889, the following experiments were recorded :—

" *No. 1055.*

Stearic acid	500 grams
Crystallized carbonate of soda	202½ grams "

This experiment was made to obviate the use of caustic soda solution, which frequently contained impurities and which did not readily filter when used in the strength of solution which we required. Also, with the object of substituting a cheaper material. The proportions were roughly figured and experiments started to get the correct amount of carbonate of soda to produce the same degree of saponification as in the regular composition. On the opposite page to No. 1055, is noted the following : 202

> " Too much carbonate, would not all dissolve and made high melting point wax." 203

In the succeeding experiment No. 1056 :

" Stearic acid	500
Carbonate of soda	140 "

The proportion of carbonate of soda was very much reduced. A note on the opposite page to experiment No. 1056, states the following :

> " Quite good but not quite enough carbonate." 204

The next experiment No. 1057 increases the carbonate of soda, and is noted in the book as follows :

" Stearic acid	500 grams,
Carbonate of soda (crystal)	150 grams,

Crystals washed and powdered in mortar, and added to melted stearic acid, little by little. Melts at 230 F."

88

205 No. 1058 states the following :

" No. 1057	100
Stearate of alumina	15
Ceresin	30 "

with a note on the opposite page, which states the following :

206
> " All O. K. exact duplicate of Regular made other ways and much cheaper and quicker made."

No. 1059 states as follows :

> " It was found that the washed crystals can be used in making No. 1058 without grinding them up, which makes it cheaper yet. The crystals come at 1¼ cents per pound. They are picked over and washed, those which are dirty dissolved and re-crystallized, which is a very small per cent." 207

No. 1059½ states the following :

> " No. 1058 with stearate of alumina made in large plant."

This means that a large quantity was then manufactured by formula No. 1058. 208

Q. 104. What is meant in the note opposite experiment No. 1058 by the words " exact duplicate of Reg made other ways " ?

A. This means that this composition in which carbonate of soda is used in place of caustic soda is the same as the previous compositions which were accepted as regular and manufactured as such, the last of which being No. 1046.

Q. 105. As I understand experiments Nos. 1055 to 1059, you use simply a cheaper form of alkali than the

Lewis Lye with which you had previously experimented ? 209

A. Yes, a cheaper and purer form.

Q. 106. What is the common or topical name of carbonate of soda ?

A. Sal soda; also washing-soda.

Q. 107. Please state on the record the relative proportions of ingredients set forth in experiment No. 1058 ?

A. Stearic acid	94.1 grams	210
Crystallized carbonate of soda (equivalent to 5.9 Na_2O)	28.2 "	
Stearate of alumina	15 "	
Ceresin	30 "	

Adjourned to Thursday, December 21st, 1905, 10.15 A. M.

ORANGE, N. J. December 21, 1905. 211

Met pursuant to adjournment.

Present: Counsel as before.

EXAMINATION OF MR. AYLSWORTH CONTINUED :

Q. 108. Please refer to experiments No. 1066 and No. 1067 and explain the same ?

A. These experiments Nos. 1066 and 1067 were combinations of stearate of soda containing excess of 212
stearic acid (No. 1036). Also, containing stearate of alumina admixed with different proportions of petroleum residue. The object of these experiments was to get a cheap substitute for the more expensive ceresin. These experiments were not considered successful enough to use.

Q. 109. What does experiment No. 1068 represent ?

A. Experiment No. 1068 relates to an experiment to recover the stearic acid from scrap wax, a considerable quantity of which had accumulated at this time, con-

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213 sisting of turnings from phonographs, broken records, sweepings from the floor of the wax room, and broken records which were returned to the works from users of the cylinders. We paid, as I recollect, about six cents a pound for such scrap wax when procured from the North American Phonograph Company. The object was to re-melt this material, but on trying some batches in which this was done, I found it too difficult to remove the dirt which they contained and conse-

214 quently looked for a method of recovering the stearic acid from the same, so that it could be used over again. A plant for this purpose was installed and all of our waste material was worked up.

Q. 110. What significance, if any, do you attach to the words "having oleic acid in it (No. 957)" which appear in connection with experiment No. 1068?

A. That that material was used in the experiment, because it represented the nature of the scrap that we had to deal with.

215 Q. 111. Do I understand from this that at the date of experiment No. 1068, you did not have to deal with any scrap from compositions No. 1029 and No. 1046, which were accepted by Mr. Edison as regular subsequent to No. 957, and which did not contain oleic acid?

A. No. It is my recollection that this particular composition was used in the experiment because it did have oleic acid present in it, with the object in view of making this material suitable for use in the wax, as

216 made at this date. That is to say—to see if the oleic acid could not be eliminated. I recollect that the scrap consisted of a composition similar to No. 957 and all succeeding compositions which were adopted as regular up to this date, September 16, 1889. Such a method was considered necessary because the scrap was known to consist in part of wax composition containing oleic acid. The method as worked out in practice was as follows:—

The scrap material was boiled up with water, sul-

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phuric acid added to this mush which precipitated the fatty acids contained, together with ceresin where compositions having ceresin were used. This fatty material was washed by boiling hot water, the fatty acids floating on top of the same as a molten thinly fluid material. This was drawn off into pans and subsequently was distilled by the aid of superheated steam and vacuum. That is to say—the operation was carried on under a diminished pressure with the aid of
superheated steam. By this distillation a purer fatty 218
acid material was obtained. This material was added in small percentages to fresh batches of wax and in that way used up. When the scrap material contained ceresin this ingredient appeared in the final product and analyses had to be performed, in order to determine the amount contained, which varied at different times on account of working up scrap which was a mixture of scrap containing no ceresin and other material containing ceresin.

Q. 112. Do I understand that as a result of the pro- 219
cess which you have just described the stearic acid in the scrap was recovered separately from any oleic acid present therein?

A. In a measure, yes, but such a method does not give a complete separation. There is always some oleic acid carried over with the product in an undecomposed condition.

Q. 113. Please refer to experiment No. 1073 and explain the same, giving approximately the date thereof,
if possible? 220

A. Experiment No. 1073 relates to the first batch of material No. 1059, which was made on a large scale in the Phonograph Works. It reads as follows:

> "No. 1059 made in Phonograph Works in large kettle (nickel). Came out O. K. and on test the cylinders were found to talk even better than others, not any crackels, which I think were due to acetic acid in old process."

221

The date at which this batch of material referred to was made, was between the dates of September 16, 1889 and October 24th, 1889, the latter date being the date under which experiment No. 1077 is recorded and the former date being the one under which No. 1068 is recorded.

Q. 114. Do I understand from this that composition No. 1059 was adopted as regular subsequent to No. 1046?

222 A. Yes.

Q. 115. After the adoption of No. 1059 as regular, what was done experimentally by you as shown by the subsequent experiments in note book No. 565?

A. The subsequent experiments were made with the object of producing a music cylinder base, that is, a special composition for taking musical records and methods of molding cylinders to improve their quality for this purpose. Also, experiments on a more or less flexible cylinder with the idea of collapsing it, so it

223 could be readily sent in an envelope through the mail. In these mailing cylinder experiments various substances were coated on suitable backings, such as various kinds of paper, making a thin cross-section which allowed the cylinder to be collapsed. In trying these experiments on the phonograph a sleeve of hard rubber was put on the phonograph mandrel, making in effect a larger mandrel having a much smaller taper than the regular mandrel. On the last page of the book was noted "Useful

224 Data", which refers to the wax composition in terms of different materials. That is—reducing the wax formula to the correct percentage where different sources of the alumina ingredients and the soda ingredients were used. The data as written is as follows:—

"USEFUL DATA

By experiment, the stearate of alumina used in the manufacture of wax was found to contain 8.755 per cent Al_2O_3.

225

Hence, in making the wax where 17 lbs. of stearate of alumina are used to 100 lbs. of stearic acid, 1.4835 lbs. of Al_2O_3 added to 115½ lbs. stearic acid would make wax containing same proportions of Al_2O_3.

Or in other figures, the proportions for making a charge of wax would be,—

Stearic acid............100 lbs. ($C_{18}H_{36}O_2$)
Crystal carbonate of soda..29.5 lbs. (Na_2CO_3 226
10 (H_2O))
Anhydrous oxide of alumina..1.282 lbs. (Al_2O_3)
Cerèsin..............................20.2.

* * * * * *

With Aluminate of Soda, the Formula would be

Stearic acid ($C_{18}H_{36}O_2$)......... 100 lbs.
Crystal carbonate of soda (Na_2CO_3
$10H_2O$).......................... 18.5 lbs. 227
Aluminate of soda (Al_2O_3 $3Na_2O$).3.618 lbs.
Ceresin ....20.2 lbs."

Q. 116. Kindly explain the "Useful Data" which appear on the last page on note book No. 565?

A. It is a reduction of the wax formula then in use to exact terms and quantities of the various ingredients, so that a calculation could be made therefrom in case it was desired to substitute any other material or source of soda or alumina, or in other words, to make 228 the same composition by any other formula or method. A formula was then worked out with the object of using aluminate of soda and carbonate of soda.

Q. 117. Referring now to note book No. 1000 explain generally the entries therein, which appear before the date of May 30th, 1889?

A. This book No. 1000 was used for original notes and the first three pages are used for recording certain data relating to wax manufacture for use in the same. Following this is a record of recovering stearic acid

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229 and ceresin from waste regular wax. The useful dedeterminations mentioned in note book No. 1000 were copied from this book in note book No. 565 as Nos. 1016 to 1020 inclusive. The note regarding the recovery of stearic acid and ceresin from waste regular wax was evidently inserted at some date subsequent to May 30th, 1889 in note book No. 1000 as useful data, because it has no number and was not copied in note book No. 565.
230 Also, because ceresin mentioned therein was not used in the composition until after May 30th, 1889. The next two pages relate to experiments on stearate of alumina.

Q. 118. In whose handwriting is the note in note book No. 1000 under date of May 30th, 1889?

A. In Mr. Edison's, and this is copied as No. 1022 in note book No. 565.

Q. 119. Did you see Mr. Edison make this note in your note book No. 1000?

231 A. Yes, I remember distinctly this incident, as he got quite enthusiastic over this particular composition. This was a special hard material for use in taking music records.

Q. 120. Please explain experiment No. 4 in note book No. 1000, immediately following this entry in Mr. Edison's hand-writing?

A. It relates to making the wax composition to determine whether or not brass or copper caldrons can be used for manufacturing wax. This composition was
232 made as follows :—

" Stearic acid (very hard and pure, from R. G. Mitchell & Co. New York)	500 grams,
Standard Solution	1105 "

Made in brass kettle to determine whether or not brass or copper caldron can be used for manufacturing wax. When stearic acid was first melted in the kettle, it became greenish,

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> and after putting in the chemicals it formed verdigris around the top, from the acetic acid given off. By suspending bright iron in while making, the copper was precipitated on the iron, probably from the acetate of copper formed."

This experiment follows immediately after the one written in Mr. Edison's hand-writing dated May 30th, 1889, and numbered No. 3½ in note book No. 1000, and 234 numbered 1022 in note book No. 565. The experiment quoted is number 4 in note book No. 1000 and is made from the Standard Solution containing caustic soda and acetate of alumina, or in other words, aluminate of soda, and this indicates that at this date, or shortly afterwards, we were making compositions in the Phonograph Works from pure stearic acid and the Standard Solution above referred to.

Q. 121. Is the stearic acid mentioned in experiment No. 4, of note book No. 1000, the same as that referred 235 to in experiment No. 1027 of note book No. 565?

A. It is the same stearic acid referred to in the formula given in No. 1027.

Q. 122. Explain experiments from No. 5 to No. 16 inclusive in Note book No. 1000?

A. The experiments referred to are re-numbered as indicated and copied in note book No. 565 and have already been referred to.

Q. 123. Having selected composition No. 1059, which you state in experiment No. 1073 (note book No. 565) 236 was "made in Phonograph Works in large kettle (nickel)" what, if anything, was done in the way of commercial manufacture of this composition?

A. I had charge of the manufacture of the wax in the Phonograph Works, at Orange, New Jersey, from the time it was started until I left the Laboratory in January, 1891. During a part of this time I was carrying on the experiments referred to in the note books. The manufacture of experiment No. 1059 was commenced sometime between the dates of September

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237 16th, 1889, and October 24th, 1889, as appears in note book No. 565 at experiments No. 1068 and 1077. The room in which the wax was manufactured in the Phonograph Works was situated next to the nickel-plating room, which was in charge of Mr. Dodd. There were a number of kettles situated in mason work in this room, and they were heated by gas burners. As I remembered it, each kettle had a capacity of about 150 lbs. of wax which allowed room for the foaming.
238 It is my recollection that there were six of these kettles, placed in a row; a burner was located under each kettle, and a hood was built over the row of kettles to carry away the fumes of the acetic acid, which came from the wax and were intolerable before the hood was built.

Q. 124. There was a good sized plant then, as I understand it, during the time that you were using acetate of alumina?

A. There was and a great many thousands pounds
239 of wax were made there using acetate of alumina.

Q. 125. Was this plant operated right along making composition No. 1059 up to the time you left?

A. After No. 1059 was adopted, it was made there until the plant had to be enlarged when it was manufactured in the building known as No. 2 building at Silver Lake, about 2½ miles from here. This plant was run by the Edison Manufacturing Company and the wax manufactured there was shipped to Orange for molding into cylinders. I had charge of the manu-
240 facture of the wax at Silver Lake until January, 1891, when I went to Jersey City to take charge there of the Filament manufacturing plant.

Q. 126. Do I understand that before you left in January, 1891, there were two wax plants in operation, one at Orange and the other at Silver Lake?

A. There were two wax plants in operation previous to the time that I left, but the plant in Orange was shut down as soon as the plant in Silver Lake was in shape to manufacture the required amount of wax.

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Q. 127. What was the capacity of the Silver Lake plant during your connection with it?

A. As I recollect at that time we had about six large caldrons. They had a capacity each of about 190 gallons, and it is my recollection that we made charges of wax of about 1200 pounds in each caldron. It took about two days to finish a batch of wax; this would make the capacity of the plant somewhere around 3500 lbs. per day.

Q. 428. Do you recall the average quantity of wax 242
composition turned out at the Silver Lake plant during the year 1890 before you left?

A. I do not recall the exact quantity, but I know that a very large quantity was made, because for a long time we worked day and night.

Q. 129. Kindly describe in detail the commercial process as carried on by you in the year 1890 at Silver Lake for the manufacture of the composition No. 1059?

A. The kettles referred to at Silver Lake were cast 243
iron, set in masonry and heated by a coal fire, with damper regulators so that the heat could be turned on any one or all of the kettles at the same time. The practice was to melt the stearic acid in an elevated lead lined tank, which was connected by a pipe having a valve with a series of bag filters enclosed in tin cylinders. After passing through these bag filters, the molten stearic acid was run into the kettles, (which kettles were also lead lined), to a definite depth which
was previously determined and marked on a gauge. 244
This gauge consisted of a measuring stick which was inserted to the bottom of the kettle and had marks on it indicating the weight of the charge. The filtered stearic acid was then brought up to a temperature of about 250 degrees F. and the carbonate of soda added gradually with constant stirring, so that at the latter end of the process the temperature was allowed to rise somewhere about 400 degrees. Then the stearate of alumina in the required proportion was added and the material foamed off, which usually took 5 to 10

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245 hours; then the ceresin was added in the required amounts and the temperature of the wax at the finish was somewhere about 450 degrees. The wax was then filtered by ladling into a canvas bag made of the kind of canvas used in filter presses. It was filtered into a brass kettle having a bail carried on a small truck and when the kettle was filled, it was removed from under the filter, another one being substituted in its place, and the full
246 kettle was elevated to a platform and poured into a chute or funnel, from which it ran into a series of pans having overflow spouts and so placed one above the other so that when the top pan was full it overflowed into the pan immediately below, and when that was full, it would overflow into the one immediately below it, and so on, until the whole series of pans were full, when the material was poured into another chute, which conveyed the wax to another series of pans, placed one above the other, in the same manner as before. There
247 were about five sections of pans so arranged and they were all enclosed in a sort of a closet to protect the wax from dust while it was cooling. This part of the plant was not used a great while, for the reason that the wax was very slow in cooling in the enclosed space and wax that was cooled in this manner looked so different when a cake was broken in two, to that which was cooled more quickly in the open that the Foreman of the cylinder making plant at Orange, thought he was getting poor material, and if anything
248 happened to be wrong with the molding of the wax, he would invariably lay it to the material and send it back. In such a case, it was our practice to re-melt and pour it into pans spread out on the floor in the open, where it cooled more quickly and ship it back again to Orange, and it went all right. I have already described the operation of making the stearate of alumina, which was done in the same way at Silver Lake, excepting that it was done on a large scale. The building devoted to wax manufacture at Silver Lake was about 50 feet by 200 feet, one story.

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Q. 130. In the above answer, you describe, as I understand it, the exact commercial operations carried on by you at Silver Lake in 1890 ?

A. That is correct.

Q. 131. You say that after all the carbonate of soda had been added to the melted stearic acid, the temperature was about 400 degrees, and that after the foaming off the temperature was about 450 degrees. Do I understand that after the addition of the carbonate of soda until the final foaming off, the temperature did 250
not drop below 400 degrees ?

A. The aim was to gradually increase the temperature as more carbonate of soda was added and then gradually increase during the foaming off until the temperature of 450 degrees F. had been reached and maintained sufficiently long to foam off.

Q. 132. In carrying on these commercial operations at Silver Lake, did you continue to observe the precautions regarding the objections to the presence of glycerine, as observed by you on August 31st, 1888, 251
and recorded in note book No. 565, following experiment No. 853 ?

A. I did. I had to constantly oppose attempts which were made by the Office in Orange, through which our material was bought, to purchase other brands of stearic acid than Mitchell's, which we used. I recall that after leaving the plant in 1891, such a change was made without my knowledge and they got into serious trouble on account of the same. They had purchased a large quantity of stearic acid from Proctor 252
& Gamble of Cincinnati, which had some of the objectionable features mentioned in the experiment noted; that is to say—glycerine, or undecomposed fats. I was called to Orange to see if I could tell what the trouble was that they were having, and after investigation, found that the trouble manifested itself in the shape of minute bubbles. I at once suspected this to be caused by the stearic acid, and on investigation found such to be the case, and that they were using a different brand, which was the brand of Proctor & Gamble's,

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before mentioned. The difficulty was overcome by buying Mitchell's stearic acid and setting aside that of Proctor & Gamble, and also the wax made from the same.

Q. 133. By using Mitchell's stearic acid at the Silver Lake plant, you also, as I understand it, avoided the difficulties explained in experiments Nos. 1026 and 1027 in note book No. 565 ?

A. Yes. I further recall that specifications as to
254 the purity of the stearic acid were afterward made, in order to avoid those troubles in the future.

Q. 134. Kindly state the exact formula used for the commercial manufacture of the composition at Silver Lake in 1890, giving the basis for your answer ?

A. The formula given in book No. 565 on the back page under the title of "Useful Data" was the one in use in manufacturing wax at Silver Lake in 1890, and is as follows :—

255

Stearic acid (Mitchell's)	100 lbs,
Crystallized carbonate of soda (Na_2CO_3 10 (H_2O))	29.5 lbs.
Anhydrous oxide of alumina (Al_2O_3)	1.28 "
Ceresin	20.2 "

Of course, it is understood that the anhydrous oxide of alumina referred to in the formula, is not put in as such, but is put in as stearate of alumina ; that is to say—a quantity of stearate of alumina, which contains 1.28 lbs. of anhydrous oxide of alumina is used ?

256

Q. 135. Please put the formula so that I can make a comparison with that set forth in answer to question 107, giving the proportion of stearate of alumina and not the anhydrous oxide of alumina ?

A. Stearic acid (Mitchell's)	100 lbs.
Crystallized carbonate of soda	29.5 lbs.
Stearate of alumina	17. lbs.
Ceresin	20.2 lbs

Q. 136. What variations in the ingredients of these compositions are permissible ?

257

A. The carbonate of soda may be varied I should say—10 per cent, without varying the nature of the wax except as to melting point. If we add too much the melting point gets too high and if we add too little the melting point will be too low. The alumina contained in the wax can vary, I should say--10 per cent either way, without affecting the wax much, and if too much alumina is added to the composition, it affects the nature of the wax so that it becomes more brittle; also more thickly fluid, so as to increase the difficulty 258 in molding. If too little is added the cylinders cannot be molded without showing crystalline spots. In the case of the ceresin, that may be varied somewhat without any serious effect, other than making the wax too soft or too hard, according whether too much or too little has been added.

Q. 137. When you left the Silver Lake plant and went into the filament business in Jersey City in January, 1891, who took charge of the wax manufacture as your successor? 259

A. Mr. Walter H. Miller.

Q. 138. Did you explain the entire process to him?

A. Mr. Miller had been in the Laboratory and was familiar with the nature of the wax as to its properties in making records, and the formula was given him at the time he took charge of the wax work at Silver Lake, and he was broken in to the work of making the wax and frequently consulted with me on this work during the time he was in charge of it.

Q. 139. When did you next have any active connection with this subject? 260

A. On October 17th, 1895, I made some experiments on the wax, which were started by a trouble that came in the manufacture of blanks or cylinders, which is noted in note book No. 1000 as follows:—

> "Investigation of the cause of black specks in wax and the wax coming dark. It was observed that the silver lined kettles became black. Tests of the different materials showed

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that it came from sulphur in the ceresin. This comes from the natural ceresin; it sometimes is found in nature in contact with a layer of sulphur two or three inches thick. This sulphur is completely removed by heating to 400 degrees with copper turnings."

Adjourned to Friday, December 22, 1905, at 10.15 A. M.

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ORANGE, N. J., December 22, 1905.

Met pusuant to adjournment.

Present :—Counsel as before.

EXAMINATION OF MR. AYLSWORTH CONTINUED:

Q. 140. At the time you refer to in your last answer, 263 were you still connected with Aylsworth & Jackson?

A. Yes. I had an arrangement with Mr. Edison, whereby I devoted five days a week for work with him and one day a week I devoted to the firm's interest (Aylsworth & Jackson), but this arrangement was made at some time in 1895, and judging from these notes, I conclude that it was in effect at this date, October 17, 1895. I also had an arrangement with the Edison Phonograph Works, by which I was paid a salary to retain my services when needed. This arrangement 264 had been made at an earlier date.

Q. 141. This latter arrangement, as I understand it was taken advantage of in the matter of your investigation of stearic acid obtained from Procter & Gamble, and referred to in answer to Q. 132?

A. I don't recall whether I was paid a salary at that time or not, but I was considered as still having an advisory position in relation to wax, and I was frequently called upon when difficulties were experienced in the manufacture of the wax and in the manufacture of cylinders.

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Q. 142. At the time you made the investigation on October 17, 1895, as recorded in note book No. 1,000, did you do any further experimenting with wax compositions, and if so, in what directions did your experiments proceed?

A. The trouble which was the cause of the investigation referred to under date of October 17, 1895, was black specks of various sizes appearing in the blanks when they were turned or shaved off, and it was thought at the time that the observation made relating 266 to sulphur was the cause of the trouble. I recollect that after overcoming the sulphur difficulty I was again called upon to investigate further trouble as regards black specks in the wax. This was rather discouraging, because I thought the work on eliminating sulphur had solved the difficulty. I next turned to the stearate of alumina as being a chance for introducing foreign material, or rather the specks, in the wax, because it being formed of a precipitate and that precipitate being dried in ovens, spread out in thin layers in pans, then 267 when dry the material was mixed with the wax and would introduce any specks or impurities which it might contain. Experiments were then started to see if the wax could not be made without the previous formation of stearate of alumina as a separate ingredient. To this end in Note book No. 1000 on the next page succeeding the one on which the date of October 17th, 1895 is given, the following is noted:—

> "Improvement in method of making wax to 268 get rid of the precipitate stearate of alumina, which is the source of much dirt and much matter, such as sulphate of soda and alum, which does not dissolve in the wax.
>
> Tried to dissolve Al in acetic acid, no good.
>
> Tried to dissolve Al in $NaCO_3$ plus aq—dissolved readily."

The Al referred to was metallic aluminum. The $NaCO_3$ plus Aq referred to is crystallized carbonate of soda, otherwise known as sal-soda.

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269 On the next succeeding page is noted an experiment to produce the phonograph wax from the solution of aluminum in carbonate of soda referred to before; it reads as follows :—

" Wax *a la* New Method

> Crystal carbonate of soda—29.08 dissolved in three times its weight of water. To this is
> 270 added, after the solution gets almost to boiling .28 parts of aluminum powder (from Pittsburg Reduction Company). When this is all dissolved, the solution is filtered hot and quickly. Al_2O_3 plus aqua will separate out when cold. The solution can now be concentrated and then will be ready to put in the stearic acid. Above is enough for 100 grams of stearic."

On the next page are three experiments noted which
271 I recollect were made for Mr. Wurth, who was making experiments on molds for duplicating. They relate to an attempt to make a very much softer material which could be more readily cut without any object of having the material wear well in reproduction. To procure the properties desired, it was necessary to soften the wax by some material which would not produce a sticky or dragging cut, which is the case when ceresin is used for the purpose of making extreme softness in the wax. I recollect that cylinders were made of these
272 mixtures and tested by Mr. Wurth. They consisted of, in the first experiment, regular wax with 25 per cent kerosene; regular wax, no ceresin, with benzine; regular wax, no ceresin, with linseed oil added. On the next page succeeding, work was again taken up on the improved method of making wax by the use of aluminum dissolved in carbonate of soda, as before recorded. The date given is October 18, 1895. The experiment is No. 33 in Note book No. 1000, and reads as follows :—

273

" 25.57 $NaCo_3$ 10 aqua } Dissolved and heated to boiling (nearly)
1—NaHO
40—H_2O

.28 grams fine powdered aluminum added to above solution,

45 cubic centimeters of this solution added to 100 grams of stearic,

20.1 grams ceresin

This will yield 123.7.

Specific gravity of soda solution should be 1.200 at 64 degrees F. 274

When made on large scale (400 lbs.) this wax came crystalline and some stearate of alumina was added which made O.K."

This latter note referring to 400 lb. lots was written after the result of a lot of wax, which I recollect was made on Sunday, according to the above formula at Silver Lake, in the presence of W. H. Miller and Al Higgins. Mr. Higgins was the man who had charge at 275 the time of the actual work of mixing the ingredients in the manufacture of the wax. The note relating to the 400 lbs. indicates that the percentage of alumina contained was not quite correct. In order to prove that such was the case and to note the effect of varying amounts of alumina, the following experiments were made. They are numbered 34, 35, 36 and 37 in note book No. 1000 and are as follows :—

" No. 34 OCTOBER 22, 1895. 276

100 Stearic }
25.5 $NaCO_3$ plus 10 aq }
1.0 NaHO }
30 H_2O }
.20 Al. powd.

Made in porcelain dish and strip of lead foil, 4 by 6 inches, was immersed with top sticking out. Solution was added at 240 degrees to 280. When all solution added, temperature run 380 degrees F. and 10 parts ceresin added (pure).

277 Wax foamed off to 440 degrees F. When finished allowed to cool in same dish as it was made in, skin formed on surface at 324 degrees F."

" No. 35

100 stearic
25.5 $NaCO_3$ plus 10 aq
278 1.00 NaHO
30 H_2O
.33 Al powd.

Made same as No. 34, except foamed off for a longer time at 400–420 degrees.

Cooled in same dish as it was made in.

Skin formed on surface at 330 degrees F."

" No. 36

100 stearic
279 25.5 $NaCO_3$ plus 10 aq
1.00 NaHO
30 H_2O
.40 Al (powd)

Wax cooked same as No. 34, congealing point 316 degrees F.

" No. 37.

280 Some hard Reg. Cooled same as No. 34, congealing point equals 288 degrees F."

In the quoted experiment No. 34, the formula states 25.5 $NaCO_3$ plus 10 aq, which means crystallized carbonate of soda or sal soda. The .20 A1. powd. is powdered metallic aluminum, which we purchased from the Pittsburg Reduction Company under the name of "Aluminum Bronze Powder". In the note following the formula, mention is made of a strip of lead foil immersed in the wax with the top sticking out. I recollect that this was done to see the effect of the wax

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making operations on the lead. Succeeding this in
the note are "10 parts of ceresin added (pure)". This
refers to ceresin in which the sulphur had been elim-
inated. The conditions of cooling are stated for pur-
poses of comparison with the other experiments men-
tioned. Also the temperature at which skin formed
on the surface was noted for purposes of comparison
with the other experiments. This point at which skin
forms on the wax in cooling varies with the degree of
saponification in the wax; that is to say—if more soda 282
is added so that the relation of the stearic acid to
caustic soda is less, the temperature at which this skin
forms will be higher. The same effects are produced
by long cooking of the wax at a high temperature,
whereby part of the stearic acid evaporates. In this
experiment, one part of NaHO was used as indicated
in the formula, which I recollect was for the purpose
of keeping the alumina all in solution, (NaHO referred
to is caustic soda, or sodium hydrate), It was neces-
sary, because as noted in the original experiment where 283
the aluminum was dissolved in carbonate of soda,
Al_2O_3 plus aqua separated out.

In No. 35, the same abbreviations have the same meaning, as explained in No. 34.

In No. 36, the same abbreviations were used.

The only difference between these experiments, No. 34, No. 35, and No. 36, is the varying amount of aluminum. The note quoted in No. 36 appears to be in my wife's hand-writing.

Experiment No. 37, which is stated to be hard Reg- 284
ular, relates to the regular composition made with
stearate of alumina separately formed, and containing
no ceresin, "hard regular" being a term I have always
used in connection with the regular composition with-
out the addition of ceresin. I recollect distinctly
making these experiments and recollect the form
of dish which they were made in. The dish
was the ordinary chemist's evaporating dish,
having a round bottom, and the cakes of wax were
afterwards cut in two, in order to note the crystalliza-

285 tion. These compositions were made without ceresin, and for that reason a sample of the Regular wax was melted and cooled the same as the others for purposes of comparison.

Q. 143. When you made your observation of October 17, 1895, in note book No. 1000, was the manufacture of wax composition still being carried on at Silver Lake?

A. It was, by the same process as previously described. 286

Q. 144. That is the process that was carried on in 1890?

A. Yes.

Q. 145. When did the trouble with the ceresin develop that you speak of?

A. It developed previous to October 17, 1895, but as I stated, it alone was not found to be the cause of all the trouble they were having at that time.

Q. 146. Did you have this difficulty with the ceresin in 1890? 287

A. We always have had the trouble referred to with the ceresin more or less, as it was found that a great many lots of ceresin had varying proportions of sulphur therein.

At this time, I took the matter up with the Commission House from whom we bought our ceresin and showed them how to make a simple test for sulphur in ceresin, which consisted of placing a piece of silver in the molten ceresin, heated to a rather high degree, and noting the blackening effect on the silver. 288 We specified in future orders a material which would stand this test.

Q. 147. In other words, as I understand it, the ceresin should be approximately pure, just as the stearic acid should be approximately pure?

A. Yes, approximately pure in respect to sulphur in ceresin and oleic and glycerides in the stearic.

Q. 148. Was sulphur present in all the batches of ceresin that you used, say—in 1890?

A. It was not. I recollect that the Commission

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289 House referred to were able to select quite a large shipment from their stock in hand, which was free from sulphur. Therefore, I infer that in 1890, we may have had pure ceresin together with more or less impure.

Q. 149. In reference to the objection to the precipitated stearate of alumina, do I understand that by reason of the process of manufacture foreign bodies were likely to contaminate this stearate?

A. Yes; I may say that the difficulties encountered 290 at this time were quite complex and very hard to account for. They manifested themselves by the black specks in the cylinders above referred to, and to a difficulty which was technically called " blinds " in making records on these cylinders. I was not sure that the black specks were the cause, but naturally went to work to obviate all the possible cause of the trouble, which work resulted in improvements in the method of making the composition referred to.

Q. 150. What I want to get at is whether the difficulties 291 which you found the Silver Lake plant to be in when you went back in October, 1895, were due to imperfections in the process, or to carelessness in manufacture?

A. They were, I should say, rather due to carelessness of manufacture in some degree, because upon inspection I found considerable foreign matter in the powdered stearate of alumina, which was nothing more than dust and lint. I think that we may have always had more or less of these impurities in this 292 powder, but at this time it was so apparent that it was my desire to overcome the trouble once and for all by changing the method.

Q. 151. And, as I understand it, you determined to go back to the original process of forming the stearate of alumina concurrently with the formation of the stearate of soda?

A. Yes; the original method of formation left nothing to be desired, except the cost of the acetate of

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alumina used and the difficulties with the acetic acid, to which I have already referred.

Q. 152. As I understand experiment No. 33, notebook No. 1000, you made a solution by adding .28 grams of powdered aluminum to 25.57 grams of salsoda, one gram of caustic soda and 40 grams of water, the dissolution being effected at a temperature near the boiling point?

A. That is correct, the carbonate of soda and
294 caustic soda were first dissolved in the water, then the aluminum powder added slowly to the solution.

Q. 153. Why was caustic soda used instead of carbonate of soda alone, as in the previous experiment?

A. With the object of making the solution retain the alumina without the separation that I at that time thought was oxide of alumina, which was mentioned in my previous experiment entitled "Wax *A La* New Method"; also, for the purpose of more rapidly dissolving the aluminum powder. I recollect that I
295 wanted to keep this caustic soda in as small an amount as would be necessary to do the work, because I wanted to avoid the solution of the impurities contained in the aluminum metal, which are small proportions of silicon.

Q. 154. When you made this solution (experiment No. 33) what reaction took place with the metallic aluminum?

A. An aluminate of soda is formed, resulting in a solution of aluminate of soda and carbonate of soda,
296 the same as in the earlier method of making wax composition, where the acetate of alumina was dissolved in soda, but with this difference; the former solution retained the acetic acid in the form of acetate of soda, while in the new solution there was no acetic acid.

Q. 155. As I understand experiments Nos. 34, 35 and 36, you were there seeking to determine the correct proportion of metallic aluminum to be used; is this correct?

297

A. That is correct.

Q. 156. Do I understand that when you were making these experiments on metallic aluminum, manufacture of the wax composition at Silver Lake was discontinued?

A. No, they did not stop.

Q. 157. Was the improved process using metallic aluminum regularly adopted?

A. The improved process was subsequently adopted when the stock of stearate of alumina then on hand 298 was used up. There was, however, a considerable quantity made by the new process around the date of October 24th, 1895. Mention of a 400-lb. lot, that is where 400 pounds of stearic acid was used, is made under the date of October 24, 1895, in book No. 1000. Also, under date of October 29th, 1895, mention is made in note book 1000 of another lot made at Silver Lake, which in this book, is numbered 47; also No. 47½ under date of November 5th, 1895. These lots, I recollect, were all right and were shipped together 299 with other wax to the Phonograph Works and there consumed in the production of cylinders.

Q. 158. Can you state what the formula was that was adopted in which metallic alumina was used?

A. I think that the formula mentioned in book No. 1000 as No. 38, was the one which was adopted as regular, under date of October 24th, 1895, because I notice on the second page succeeding this, mention is made of "variation of regular" in which the percentage of aluminum is increased slightly, the proportion 300 being the same.

Q. 159. Please put on the record formula No. 38, which you say was adopted?

A.	400	lbs.	Stearic
	92	lbs.	$NaCO_3$ ($10\ H_2O$) Sal-soda,
	1359	grms.	NaHO
	598	"	Al (powd)
	120	lbs.	H_2O
	80	lbs.	ceresin.

301 In the above formula as originally put down under No. 38 in note book No. 1000, the sal-soda is given the formula—$NaCO_3(1OH_2O)$—which is incorrect, there being no carbonate of soda of exactly that formula. The correct formula of the carbonate of soda there used is—$Na_2CO_3(1OH_2O)$.

Q. 160. Do I understand that when the new process using metallic aluminum was adopted, you continued to use this process and the old alum process at Silver
302 Lake concurrently until the stearate of alumina on hand was used up ?

A. Yes.

Q. 161. Do you recall about how long it was before the metallic aluminum process was used altogether ?

A. It is my recollection that we had a considerable stock of the stearate of alumina on hand and that it was some time after that, possibly five or six weeks, when the metallic aluminum process was used altogether.

303 Q. 162. Describe exactly the procedure, giving temperatures, if possible, that was followed at the Silver Lake plant in commercially carrying out the metallic aluminum process.

A. The solution containing the metallic aluminum was made in a steamjacketed iron kettle, the same one which we had previously used for making the stearate of soda used to precipitate stearate of alumina from. The solution was prepared by dissolving carbonate of soda and caustic soda in the proportions
304 stated in the formula and allowing the temperature to get somewheres near the boiling point. The aluminum powder was then added in small portions at a time, whereby a violent reaction took place, hydrogen being liberated and aluminate of soda being formed. I recollect that the first lot made in this kettle caused us considerable annoyance, because the kettle had not been thoroughly cleaned out and some small traces of soap from the previous operations which were conducted in it were left, which caused the new solution to froth badly, and it kept us on the jump to prevent

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the solution from foaming over the top of the kettle. After the aluminum was all dissolved, the solution was filtered through a bag made of filtering canvas, and was then added to the molten stearic acid in the same manner as described in my previous testimony in this case, relating to the manufacture af wax at Silver Lake by the alum process.

Q. 163. Did the solution containing aluminate of
soda, when added to the stearic acid, saponify the 306
latter?

A. When the solution was added to the molten
stearic acid, it incompletely saponified the
stearic acid, as regards the formation of
stearate of soda. A part of the stearic
acid was saponified by the aluminate of soda
contained in the solution, with the result that stearate
of alumina was formed simultaneously with the stearate
of soda, so that the final product is imperfectly saponi-
fied stearic acid and stearate of alumina. 307

Q. 164. Having reference to the formula you refer to in answer to Q. 47 (No. 858 of note book No. 565) kindly give the percentage of saponification of the stearic acid?

A. 49.9 per cent.

Q. 165. Referring to the formula given in your answer to Q. 60 (No. 871 of note book 565), please give the percentage of saponification of stearic acid?

A. 52.8 per cent.

Q. 166. Referring to the formula given in answer to 308
Q. 73 (No. 957 of note book No. 565), please give the
percentage of the saponification of the stearic acid?

A. 56.5 per cent.

Q. 167. Referring to the formula given in answer to Q. 102 (No. 1046 of note book No. 565), please state the percentage of saponification of the stearic acid?

A. 52.5 per cent.

Q. 168. Regarding the formula given in answer to question 107 (No. 1058 in note book 565), please state the percentage of saponification of the stearic acid?

A. 49.9 per cent.

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Q. 169. Kindly also give the same information concerning the formula given in answer to Q. 135?

A. 48.1 per cent.

Q. 170. Please also give the same information concerning the formula given in answer to Q. 159?

A. 48.4 per cent.

Q. 171. Have you read the patent to Macdonald herein suit No. 606,725, dated July 5, 1898?

A. I have.

310 Q. 172. In this patent Mr. Macdonald states that he takes "stearic acid as nearly pure as can be obtained" and that he has found "that the presence of even a small quantity of oleate or oelic acid is detrimental." As a result of your experience, is it possible to obtain commercial stearic acid absolutely free of oleic acid and do you consider the presence of "a small quantity" of oleate or oelic acid to be detrimental?

A. It is not possible to obtain stearic acid entirely free of oleic acid in commerce. I have tested
311 samples from every grade I could obtain for oleic acid and have always found them to contain from 2 to 8 per cent. of oleic acid. The purest material which we could obtain varied from 2 to 5 per cent. in different shipments and even to this day manufacturers are not able to get the percentage of oleic much below these figures. I do not consider anything below 5 per cent. to be objectionable for use in the wax composition. I have made very careful tests relating to this and on the basis of these tests we specify our material to be
312 below 5. per cent.

Adjourned to Saturday, December 23d, 1905, at 10.15 A. M.

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ORANGE, N. J., December 23, 1905.

Met pursuant to adjournment.

Present: Counsel as Before.

EXAMINATION OF MR. AYLSWORTH CONTINUED.

Q. 173. Kindly prepare a comparative statement
showing the proportion of ingredients of the two for-
mulas given by Macdonald in the patent in suit; also, 314
of the following formulas referred to in the testimony
which you have already given, namely, No. 858 of note
book No. 565, (given in answer to Q. 47) No. 871 of
note book No. 565, (given in answer to Q. 60) No. 957
of note book No. 565, (given in answer to Q. 73) No.
1046 of note book No. 565, (given in answer to Q. 102)
No. 1058 of note book No. 565, (given in answer to Q.
107) the "Useful Data" formula, on the last page of
note book No. 565 (given in answer to Q. 135) and No.
38 of note book No. 1000 (given in answer to Q. 159). 315

A. I have prepared a statement which I present herewith, showing this comparison. In this statement a list comprising all the different forms of the ingredients which were used in the formulas given in Macdonald's patent, and also those called for by the question. These ingredients are written in the first column of the statement as follows:

Stearic acid (meaning the commercial grade of that
material), which, as I have explained in previous testi-
mony, is composed of about 50 per cent. of the pure 316
chemical, known as stearic acid, which has the formula
of $C_{18}H_{36}O_2$, and the balance consisting of chiefly
palmitic acid, having a formula of $C_{16}H_{32}O_2$. In the
calculation I use a formula for stearic acid consisting
of a mean of these two, which is $C_{17}H_{34}O_2$, as noted
in the last column of the statement. Also, this ma-
terial always contains from 2 to 5 per cent of oleic
acid, as stated in previous testimony. The next item
is oleic acid, otherwise known as red oil.

The next item is stearate of alumina, which in the

317 calculation is considered as having a formula of Al $(C_{17}H_{33}O_2)_2$. This formula refers to the actual material as it would be made from commercial stearic acid; that is, to say—it represents a mean of stearate and palmitate of alumina. The next item is acetate of alumina dry. The formula of this material is rather indefinite, but I have assumed the formula given in Watt's Chemical Dictionary to come most nearly to the material which we use. It is $(Al_2O_3)_2$ $(C_4H_6O_3)_2$
318 $(H_2O)_2$.

The next item, hydrate or alumina is taken as being the tri-hydrate, having a formula of $Al_2O_33(H_2O)$. The next ingredient is Aluminum metal. The next ingredient—caustic soda, having the formula NaOH, as obtained in commerce, usually contains more or less water as an impurity, and this being unknown, the material used in the various formula is considered in all of them to be 100 per cent pure.

The next ingredient, caustic soda lye (37.5 degrees
319 B), refers to the solution used in the Macdonald patent, 37.5 degrees Beaume equals a specific gravity of 1.35. A solution of this specific gravity contains 32 per cent of caustic soda.

The next ingredient—sal-soda, otherwise known as crystallized sodium carbonate, has the formula of $Na_2CO_310H_2O$, and is considered as the pure article. The next ingredient represents sodium oxide, having a formula of Na_2O. This ingredient is not added to the wax in any of the formulas as such, but represents the
320 weight of soda, which remains as a fixed amount in the finished product, no matter what form the soda was added as.

The next ingredient is ceresin.

The next item in the first column represents the per cent of stearic acid saponified, that is—completely saponified to form the neutral stearate of soda. This represents the stearic acid saponified by soda only. The alumina ingredients also combines with and in effects saponifies a considerable amount of the stearic acid, in all of these formulas. This, however, is not

321 included in the figures following "per cent of stearic acid saponified'.

In the second column the figures for formula A, given in the Macdonald patent are written, and those which are underscored represent the actual amounts of the material given in the patent. The other figures in this column, not underscored, represent the equivalent amounts of the other forms of the same ingredients which are underscored. The same may be said of formula B in the third column. This is done in order to 322 compare the formulas referred to in the question with the Macdonald patent. The formulas referred to in the patent are figured by simple arithmetic, so that the stearic acid which is the chief ingredient in all of the compositions given, shall be the same as in formula A of the Macdonald patent, namely 408 lbs. The other ingredients are figured on a basis of 408 lbs. of stearic acid.

> The statement referred to by the witness is offered in evidence and marked "Defendant's Exhibit, Comparative Statement". 323

Q. 174. As I understand the statement which has just been introduced in exhibit, you have for the purposes of comparison converted the 7 lbs. of alumina hydrate referred to formula A of Macdonald's patent into an equivalent amount of the acetate of alumina (15.3 lbs.) and also into an equivalent amount of metallic aluminum (2.43 lbs.)

A. That is correct. 324

Q. 175. And as I also understand it, for the purposes of comparison you have calculated the amount of stearate of alumina produced in Macdonald's formula A as 48.4 lbs.

A. Yes.

Q. 176. And as I understand it, your calculations show that 85 lbs. of caustic soda lye referred to in Macdonald's formula A would contain 27.2 lbs. of caustic soda.

A. Yes.

325

Q. 177. And am I correct in understanding that if instead of using caustic soda, Macdonald, in formula A, had used sal-soda, the amount of the latter required would be 97.1 lbs.

A. You are correct.

Q. 178. Having reference to formula No. 957, referred to in answer to Q. 73, do I understand from your answer to Q. 78 that all the cylinders made with this formula containing added oleic acid, had to be called back? 326

A. No, I recollect that the difficulty did not always occur with every lot of wax. This, I believe, was due to the fact that the oleic acid was contained in some of the compositions in larger amounts than in others, owing to varying amounts of oleic occurring in the grade of stearic acid.

Adjourned until Wednesday, December 27th, 1905, at 10.15 A. M.

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ORANGE, NEW JERSEY, December 27th, 1905.

Met pursuant to adjournment.

Present: Counsel as before.

EXAMINATION OF MR. AYLSWORTH CONTINUED.

Q. 179. Kindly prepare and incorporate in your answer, a comparative statement showing the relative proportions of ingredients in formula A, of the Macdonald patent in suit, and in the formula of experiment No. 858, (referred to in answer to Q. 47). Since the Macdonald patent describes the use of hydrate of alumina as the source of alumina, and as you used in your formula referred to, acetate of alumina as the source of alumina, kindly express the comparative figures in respect to the source of alumina in terms of the acetate. Also, indicate the figures for your formula on a basis of 408 pounds of stearic acid, that 328

329

being the amount used in the Macdonald formula. Also, in your answer, for purposes of additional comparison, indicate the amount of stearate of alumina produced in the two formulas, as well as the percentage of saponified stearic acid?

A.

Macdonald (*Formula A*)		Aylsworth (*Formula No. 858*)	
408 pounds	Stearic acid	408 pounds	330
27.2 "	Caustic soda	30.2 "	
15.3 "	Aluminum Hydrate (Expressed in terms of acetate of alumina.)	14.7 "	
72 "	Ceresin	None	

Note: Amount of stearate of alumina formed—

Macdonald	48.4 pounds	
Aylsworth	48.3 "	

Percentage of saponified stearic acid:—

Macdonald	44.9 per cent	331
Aylsworth	49.9 per cent	

Q. 180. Kindly prepare a similar statement, and incorporate the same in your answer, showing the comparison based on 408 pounds of stearic acid, between formula A of the Macdonald patent in suit, and your formula No. 871 (referred to in Q. 60), indicating the source of alumina in terms of the acetate, and showing also, the amount of stearate of alumina formed and the percentage of saponified stearic acid in each case? 332

A.

Macdonald (*Formula A*)		Aylsworth (*Formula No. 871*)
408 pounds	Stearic acid	408 pounds.
27.2 "	Caustic Soda	32 "
15.3 "	Aluminum Hydrate (Expressed in terms of acetate of alumina.)	12.6 "
72 "	Ceresin	None

333

Note: Amount of stearate of alumina formed:—

Macdonald	48.4 pounds,
Aylsworth	41.7 "

Percentage of saponified stearic acid:—

Macdonald	44.9 per cent,
Aylsworth	52.8 " "

334 Q. 181. Kindly prepare a similar statement, and incorporate the same in your answer, based on 408 pounds of stearic acid, showing a comparison between formula A of the Macdonald patent in suit, and your formula No. 957 (referred to in Q. 73), expressing the source of alumina in terms of the acetate, and showing the amount of stearate of alumina formed, and the percentage of saponified stearic acid in each case.

A.

335

Macdonald (*Formula A*)			Aylsworth (*Formula No. 957*)	
408	pounds	Stearic acid	408	pounds
27.2	"	Caustic Soda	34.2	"
15.3	"	Aluminum Hydrate (Expressed in terms of acetate of alumina.)	13.7	"
72	"	Ceresin	None	
None		Oleic acid	20.4	"

336 *Note:* Amount of stearate of alumina formed:

Macdonald	48.4 pounds,
Aylsworth	45 "

Percentage of saponified stearic acid:—

Macdonald	44.9 per cent,
Aylsworth	56.5 " "

Q. 182. Kindly prepare a similar statement, and incorporate the same in your answer, showing a comparison based on 408 pounds of stearic acid, between

337 formula A of the Macdonald patent in suit, and your formula No. 1046 (referred to in Q. 102). As I understand that with your formula you made use of stearate of alumina, independently formed and added as such, kindly express the source of alumina in both formulas in terms of stearate of alumina. Also, indicate the percentage of saponified stearic acid in each case?

A.

338

Macdonald (*Formula A*)		Aylsworth (*Formula No. 1046*)
408 pounds	Stearic acid	408 pounds
27.2 "	Caustic Soda	31.8 "
48.4 "	Aluminum Hydrate, or corresponding stearate of alumina	56.9 "
72 "	Ceresin	113.7 "

Note: Percentage of saponified stearic acid:—

Macdonald..........44.9 per cent. 339

Aylsworth..........52.5 per cent.

Q. 183. Please prepare a similar statement and incorporate the same in your answer, showing a comparison between formula A of the Macdonald patent in suit, and your formula No. 1058 (referred to in Q. 108). Since carbonate of soda was used in your formula as the source of soda, and caustic soda is referred to in Macdonald's formula as the source of soda, kindly express the source of soda in the comparative statement 340 in terms of caustic soda.

Regarding the source of alumina, please express the same in terms of the stearate thereof, that being the source of alumina employed by you and necessitating the conversion of the alumina hydrate of the Macdonald formula into the stearate. Also, in your answer, indicate the percentage of saponified stearic acid in each case?

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A.

	Macdonald (Formula A)			Aylsworth (Formula No. 1058)	
	408	pounds	Stearic acid	408	pounds
	27.2	"	Carbonate of soda or corresponding caustic soda	29.1	"
342	48.4	"	Alumina Hydrate — expressed in terms of stearate of alumina	56.8	"
	72	"	Ceresin	113.6	"

Note : Percentage of saponified stearic acid :—

Macdonald..........44.9 per cent.
Aylsworth..........49.9 " "

Q. 184. Please prepare a corresponding statement, and incorporate the same in your answer, showing a comparison between formula A of the Macdonald patent in suit, and your " Useful Data " formula (referred 343 to in Q. 135), indicating the source of soda in terms of caustic soda, and the source of alumina in terms of stearate of alumina, and showing also, the percentage of saponified stearic acid in each case.

A.

	Macdonald (Formula A)			Aylsworth (" Useful Data " Formula)	
	408	pounds	Stearic acid	408	pounds
344	27.2	pounds	Carbonate of soda, or corresponding caustic soda	29.12	"
	48.4	"	Alumina Hydrate, expressed in terms of stearate of alumina	60	"
	72	"	Ceresin	71.3	"

Note : Percentage of saponified stearic acid :—

Macdonald..........44.9 per cent.
Aylsworth..........48.1 per cent.

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Q. 185. For the purpose of comparing the two formulas, A and B, of the Macdonald patent in suit, kindly prepare a corresponding statement, and incorporate the same in your answer, indicating the ingredients of both formulas on a basis of 408 pounds of stearic acid, expressing the source of soda in formula B in terms of caustic soda, and the source of alumina in formula A in terms of metallic aluminum. In the same statement indicate the amount of stearate of alumina formed, and the percentage of saponified stearic 346 acid in each case.

A.

Macdonald (*Formula A*)		Macdonald (*Formula B*)
408 pounds	Stearic acid	408 pounds
27.2 "	Carbonate of soda, or corresponding caustic soda	26.7 "
2.43 "	Aluminum Hydrate, expressed in terms of metallic aluminum	2.04 "
72 "	Ceresin	81.6 "

347

Note: Amount of stearate of alumina formed:—

Formula A……48.4 pounds,
Formula B……40.6 "

Percentage of saponified stearic acid:— 348

Formula A……44.9 per cent.
Formula B……44.1 per cent.

Q. 186. Please prepare a corresponding statement, and incorporate the same in your answer, showing a comparison between formula B of the Macdonald patent in suit, and your formula No. 38 (referred to in Q. 159). In this statement, indicate the ingredients of your formula as being based on 300 pounds of stearic acid, the amount referred to in the Macdonald formula.

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Show also, the amount of stearate of alumina formed, and the percentage of saponified stearic acid in each case.

A.

	MACDONALD (Formula B)			AYLSWORTH (Formula No. 38)	
	300	pounds	Stearic acid	300	pounds
	60	"	Carbonate of Soda	69	"
	2.88	"	Caustic Soda	2.25	"
350	1.5	"	Metallic aluminum	1	"
	60	"	Ceresin	60	"
	12	gallons	Water	11.2	gallons

Note : Amount of stearate of alumina formed :

Macdonald—30 pounds,
Aylsworth —20 "

Percentage of saponified stearic acid :

Macdonald—44.9 per cent.
351 Aylsworth —48.4 per cent.

Q. 187. After the adoption of the metallic aluminum process, did the Edison Manufacturing Company continue to make the composition at Silver Lake ?

A. Yes, the wax was made at Silver Lake for sometime, but just at what date we ceased to manufacture at Silver Lake and began in Orange again, I do not remember, but as near as I can recollect, it was sometime in 1896.

352 Q. 188. Did you have charge of the commercial manufacture of the wax composition under the metallic aluminum process at Silver Lake and on the removal of the plant to Orange ?

A. I did.

Q. 189. How long did you have charge of this work ?

A. From the time when I was first called upon as I have already mentioned to correct the defects in the material, which was caused from a bad lot of stearic acid, I continued to have charge of this work in an advisory way until the present.

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Q. 190. After the adoption of the metallic aluminum process, who had charge of the weighing and handling the separate ingredients; or in other words, who was it that had practical charge of the formula?

A. At Silver Lake, this work was done by Al Higgins, and after the manufacture was started at Orange, a man named Aschenger had charge of the formula and of the weighing and mixing.

Q. 191. Has Aschenger still charge of the work?

A. No, he left, I think, sometime in 1897, and was 354
succeeded by D. A. Dodd.

Q. 192. Have you seen Aschenger since he left, or do you know where he is now?

A. I have not, I have heard, however, that he is dead.

Q. 193. When you hit upon the expedient of using metallic aluminum as the source of alumina in the composition, did you make any effort to conceal the identity of this ingredient?

A. I did, and to that end, gave the material a num- 355
ber and instructed the firm from which the aluminum
was purchased to mark the same as "No. 1", and bill
it to us as "No. 1 ingredient."

Q. 194. This material, as I understand it, was known at the time as aluminum bronze powder?

A. That is correct.

Q. 195. How long did you continue to use powdered aluminum in the composition?

A. The first experiment in which sheet aluminum
was used was made November 15th, 1895. The sheet 356
aluminum was used at a later date in the actual manufacture. As I recollect, we did not use the sheet aluminum in manufacture until after the wax was made by the Phonograph Works at Orange.

Q. 196. Why was the sheet form of aluminum used instead of the powdered form?

A. On account of being much cheaper.

Q. 197. From whom did you buy the powdered aluminum and sheet aluminum?

A. From the Pittsburgh Reduction Company, through their New York Office.

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Q. 198. I show you voucher No. 723 from the Edison Manufacturing Company, containing bills from the Pittsburgh Reduction Company, dated November 16th, 1895, and also a receipt from the Pittsburgh Reduction Company dated November 21st, 1895, and ask if you can identify the same?

A. Yes, I can identify the receipted bill dated November 21st, 1895, stating "10 lbs. of No. 1 ingredient" as being a lot which I purchased personally 358 from the Pittsburgh Reduction Company. I know this because the receipt is in my name and was O. K'd by me. The No. 1 ingredient referred to, in this receipt is aluminum powder.

Q. 199. How much of the composition would be represented by the aluminum powder mentioned in the (three) bills referred to?

A. About 10,000 lbs. of wax composition.

Q. 200. Can you produce samples of blanks made at the present time by the Edison Phonograph Works?

359 A. Yes, the two blanks I have here were manufactured by the Edison Phonograph Works and are of the same composition as that which has been used since 1895.

Q. 201. That is, as I understand it, the two blanks last referred to were made by the metallic aluminum process?

A. Yes.

Q. 202. And do I understand that blanks similar to those which you have produced are being manu- 360 factured at the present time by the Edison Phonograph Works?

A. They have been continuously manufactured.

Q. 203. How do these modern blanks, which you have introduced, compare in their chemical constitution and physical properties, with the blanks made by the Edison Manufacturing Company, say—in 1890, at Silver Lake?

A. These blanks are practically the same composition as those used in 1890. The color and appearance is similar to those made at that time. The color of

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these blanks is caused by the high temperature and prolonged melting of the composition. The recording properties are practically the same. Improvements have been demanded in the way of purity, and these blanks are better in that respect than the ones made in 1890. These improvements have resulted from greater care in the manufacture and the improved method of making the wax, and not to any radical change in the composition. We have always been conservative about the composition of this material 362 and the aim has been when a change in method was introduced in the manufacture of the composition, to keep as near as possible to the original, or former proportion of stearic acid to soda and alumina. The alumina ingredient has been changed in small per cents from time to time and when the change from the stearate of alumina separately made to the use of metallic aluminum was made, we did not hit the exact ratio of aluminum, but the quantity used was determined experimentally and worked all right and we 363 have continued to use this smaller amount with the exception of very slight variations, up to the present time. The ceresin ingredient has also been changed from time to time to suit the demands of the record-taking trade. The tendency of this has been a reduction in the amount of ceresin to produce a wax slightly harder and obviate all gummy tendencies of the shaving produced in taking a record.

Q. 204. Do I understand that the modern blanks referred to by you differ from the blanks made in 1890 364 and continuously since then, in any respect as to their ultimate chemical constitution, except possibly, as to purity?

A. None whatever, excepting the purity and the small variation of percentages of alumina and ceresin, before mentioned.

> Counsel for defendant, in view of the fragile character of the blanks referred to by the witness and the possibility of breakage, offers

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365 both of them in evidence, and each is marked "Defendant's Exhibit, Modern Blank."

Q. 205. I show you a record marked "Defendant's Exhibit, Upton Record" and ask if you can identify this as an Edison record?

A. From all appearance, I should say it was an Edison record.

Q. 206. Assuming that this Upton record is an Edi-
366 son record made prior to January 1893, of what composition is it formed?

A. It is composed of stearic acid, soda, alumina, and ceresin, or in other words, stearate of soda, stearate of alumina, free stearic acid and ceresin, in about the same proportions as those manufactured to-day.

Q. 207. Subsequent to early in 1889, did either the Edison Phonograph Works or the Edison Manufacturing Company ever manufacture and sell, records in large quantities composed of any other composition
367 than that referred to in your last answer, with the exception of those containing oleic acid, which you state were not made after the summer of 1889?

A. They never manufactured and sold blanks or composition, other than the composition referred to in my previous answer.

Q. 208. Kindly produce samples of stearic acid, of ceresin, of oleic acid, of stearate of alumina, of salsoda, of aluminate of soda, of acetate of alumina, of stearate of soda—50 per cent saponification, of pow-
368 dered aluminum, of sheet aluminum, of caustic soda and of alum, all of which have been referred to in your testimony.

A. I produce samples of the chemicals referred to.

The samples referred to by the witness are offered in evidence and marked respectively—"Defendant's Exhibit, Stearic Acid", "Defendant's Exhibit, Ceresin", "Defendant's Exhibit, Oleic Acid", "Defendant's Exhibit, Stearate of Alumina", "Defendant's Exhibit, Sal-

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soda", "Defendant's Exhibit, Aluminate of Soda", "Defendant's Exhibit, Acetate of Alumina", "Defendant's Exhibit, Stearate of Soda—50 per cent saponification," "Defendant's Exhibit, Powdered Aluminum", "Defendant's Exhibit, Sheet Aluminum", "Defendant's Exhibit, Caustic Soda", and "Defendant's Exhibit, Alum".

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ORANGE, N. J. March 14, 1906.

Met pursuant to agreement.

Present: C. A. L. MASSIE, ESQ., for Complainant, FRANK L. DYER, ESQ., for Defendant.

The examination of the witness JONAS W. AYLSWORTH is continued by Mr. Dyer. 371

Q. 209. Defendant's witness, Melzer, in describing the manufacture of phonograph compositions by him before the date of the application for the patent in suit states (Q. 34) that he sometimes introduced the paraffine or ozocerite before the saponification of the stearic acid and that at other times the paraffine or ozocerite was added after such saponification and that he regards the time during which the paraffine or ozocerite was added as unimportant. 372 Assuming that the temperature stated in the patent in suit to be used, namely, about 300° F., is Mr. Melzer correct in this statement?

A. Yes, I would consider that he is correct in that statement, as in the manufacture of wax I have added hydrocarbon, (generally ceresin) both before and after saponification and no difference was apparent in the resulting composition. The time for adding the hydrocarbon is absolutely immaterial with respect to the saponification.

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Q. 210. In the patent in suit, Macdonald states that the heating of the composition is continued "until the water is all expelled. The composition is now completed, except for the addition of a material, such as paraffine, ozocerite, or ceresin, to bring it to the desired degree of hardness" (page 2, lines 50–59). Do you regard the suggestions in the patent in suit in this respect as describing a desirable procedure?

A. No, I consider that the time that the patent
374 describes to be the very worst time to add ceresin or equivalent hydrocarbon, for the reason that there are contained in the hydrocarbon material, impurities which cause more or less foaming, and if they are added at the end of the operation, after the foaming has been finished, there is not ample opportunity for foaming off these impurities. If the hydrocarbon is added before the foaming off, the impurities contained in it are carried off along with the water and other impurities.

375 Q. 211. Kindly prepare and place on the record a comparative statement, showing the relation between the composition of formula A of the patent in suit, and the first formula of November 4th, 1894, mentioned by Mr. Melzer in answer to Q. 23 in his deposition?

A. On a basis of 408 lbs. of stearic acid, a comparison between the two would show the following:

Stearic acid	Macdonald	408	lbs.	Melzer	408	lbs
Paraffine	"	72	"	"	52	"
376 Caustic Soda Lye, in terms of Caustic soda	"	27.2	"	"	25.9	"
Aluminic hydrate	"	7	"	"	7.4	"

Q. 212. Are you able to state from your knowledge in this art, how compositions constructed in accordance with these two formulas would compare in their physical properties?

A. The Melzer composition on account of containing less paraffine than that of the Macdonald patent would be somewhat more brittle. There is slightly more alkali in the Macdonald patent than in the Melzer formula, which would have the effect of making the Macdonald composition slightly higher in melting point.

Q. 213. Please prepare and put on record a comparative statement, showing the relation between the second formula, referred to by Mr. Melzer in answer to question 23 of his deposition, and formula A of the Macdonald patent in suit ?

A. On a basis of 408 lbs. of stearic acid, a comparison between the two would show the following :

Stearic acid	Macdonald	408	lbs.	Melzer	408	lbs.
Paraffine or ozocerite	"	72	"	"	50.5	"
Caustic Soda lye, in terms of Caustic Soda	"	27.2	"	"	26.2	"
Aluminic Hydrate	"	7	"	"	8.4	"

Q. 214. How would wax compositions made after the formulas which you have above compared, compare in their physical properties ?

A. This Melzer composition, like the former one, would also be more brittle than the Macdonald composition. Also, I should say that the latter composition of Melzer's would be slightly smoother in cutting, owing to the use of ozocerite, which makes a somewhat smoother composition than paraffine.

Q. 215. Please prepare a similar comparative statement between Mr. Melzer's formula F, referred to in answer to question 42 of his deposition, and formula of the Macdonald patent ?

A. On a basis of 408 lbs. of stearic acid, a comparison between the two would show the following :

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Stearic acid	Macdonald	408	lbs.	Melzer	408	lbs.
Paraffine	"	72	"	"	72.7	"
Caustic soda lye, in terms of caustic soda	"	27.2	"	"	28.9	"
Aluminic Hydrate	"	7	"	"	7.07	"

382 Q. 216. Please prepare a similar comparative statement between Mr. Melzer's formula I, referred to in the same answer, and formula A of the patent in suit?

A. On a basis of 408 lbs. of stearic acid, a comparison between the two would show the following :

Stearic acid	Macdonald	408	lbs.	Melzer	408	lbs.
Paraffine or ozocerite	"	72	"	"	66.6	"
383 Aluminic Hydrate	"	7	"	"	8.32	"
Caustic soda lye, in terms of caustic soda	"	27.2	"	"	30.5	"

Q. 217. Please prepare a similar comparative statement between Mr. Melzer's formula K, referred to in the same answer, and formula A of the Macdonald patent in suit? 384

A. On a basis of 408 lbs. of stearic acid, a comparison between the two would show the following :

Stearic acid	Macdonald	408	lbs.	Melzer	408	lbs.
Paraffine or ozocerite	"	72	"	"	74.8	"
Aluminic Hydrate	"	7		"	8.32	"
Caustic soda lye, in terms of caustic soda	"	27.2	"	"	31.9	"

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Q. 218. Would you be able to say how these three formulas of Mr. Melzer, F, I and K, would compare in the physical properties of the compositions, with the composition of formula A of the patent in suit ?

A. These three compositions would compare very closely in physical properties with formula A of the patent in suit. In fact, formula F, would be almost identical with formula A of the Macdonald patent in suit. In the last three formulas, Mr. Melzer has added considerably more paraffine or ozocerite, than in the 386
first two formulas of Melzer, which I have considered, and therefore, these compositions would be less brittle than the first two.

Q. 219. In dissolving aluminic hydrate, or oxide of alumina, hydrated, in caustic soda lye, what would have been the ordinary chemical procedure in 1894 ?

A. The most natural procedure for a chemist would be to add the aluminic hydrate to the caustic soda lye and heat it until solution of the aluminic hydrate took place, which would take place more or less completely 387
at temperatures below the boiling point, but would be hastened by bringing the same to the boiling point.

Q. 220. In adding caustic soda solution to stearic acid for the purpose of partially saponifying the same, what would have been the ordinary chemical practice in 1894 ?

A. The ordinary practice for performing that operation would be to first melt the stearic acid, and add the caustic solution to the same carefully, which 388
would mean putting the solution in a little at a time, so as to prevent excessive foaming, or ebullition.

Q. 221. Having reference to the five formulas of Mr. Melzer, which you have compared with formula A of the patent in suit, would the stearic acid in the several Melzer formulas be completely saponified, and if not, what would be approximately the extent of the saponification ?

A. The stearic acid in those compositions is not completely saponified, there being only enough alkali added to saponify about 50% of it.

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Q. 222. Please make a comparison between Mr. Melzer's formula L, referred to in answer to question 53, and formula A of the patent in suit?

A. These formulas are identical, as will be seen by using 8 as a factor and multiplying the figures in Melzer's formula by that factor, which will give the exact figures of the formula A of the Macdonald patent in suit. I notice, however, that in the patent in suit, 37½° B. is used, where in Melzer's formula, 37° B. is 390 used. The difference of the ½ degree Baumé would be immaterial in the composition, as it would affect the saponification only about 1%, and the melting point a few degrees only.

Q. 223. Please make a comparison between Mr. Melzer's formula M, referred to in answer to question 53 of his deposition, and formula A of the patent in suit?

A. On a basis of 408 lbs. of stearic acid, the comparison of the two formulas would show the following:

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Stearic acid	Macdonald	408 lbs.	Melzer	408 lbs.
Caustic soda lye	"	85 "	"	88 "
Ozocerite	"	72 "	"	100 "
Hydrate of alumina	"	7 "	"	7 "

Q. 224. In adding metallic aluminum to caustic soda lye, what would be the procedure to effect the dissolution of the aluminum?

A. If aluminum powder is used, it would be preferably added to cold or slightly warm solutions, as the reaction itself produces a large amount of heat, and is rather 392 violent if the solution is heated beforehand. In the case of sheet or ingot aluminum, the reaction will also take place with a cold solution at the start, but will be more slow in starting, in which case, one would naturally heat the solution to hasten the operation of starting the reaction.

Q. 225. To what extent would it be desirable to heat the caustic solution in starting the reactions when sheet aluminum is to be dissolved therein?

A. Thirty or 40 degrees above the normal room temperature is sufficient to hasten the operation.

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Q. 226. Then, as I understand it, in dissolving metallic aluminum in caustic solution, it is neither necessary nor desirable to heat the solution to the boiling point before adding the metal?

A. No, it is not necessary nor desirable.

Adjourned until tomorrow, March 15, 1906, at 1.30 P. M.

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ORANGE, NEW JERSEY, March 15, 1906.

Met pursuant to adjournment.

Present: Counsel as before.

EXAMINATION OF MR. AYLSWORTH CONTINUED AS BEFORE

Q. 228. In the patent in suit, Macdonald states that
before adding the hot caustic solution to the stearic
acid, the latter " is melted and raised to about the 395
same temperature ", *i. e.*, 242° F. Is the temperature
of the stearic acid when the caustic solution is added
thereto of any practical importance?

A. It is immaterial whether the stearic acid is heated
to 242°, or above or below that figure. It may be
added to the cold stearic acid, and the two brought up
to a temperature sufficient to melt the stearic to form
the combination and drive off the water; it may be
added to the molten stearic acid at a temperature be-
low the boiling point of water and the temperature 396
then raised to expel the water, or it may be added to
the melted stearic acid brought to a temperature above
the boiling point of water, so that the chemical reac-
tion and the expulsion of water take place simul-
taneously. It is more desirable to add the solution to
the melted stearic acid than to the solid stearic acid,
and still more desirable to add the solution to the
stearic acid brought to a temperature above the boil-
ing point of water. The higher this temperature is, up
to about 300°, the better. It would not be desirable

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to heat the stearic acid to much more than 300° before
adding the alkali solution on account of the evaporation of the stearic acid, which would take place. Any
one skilled in the art of mixing compositions would
naturally add the caustic solution to the stearic acid
heated to a temperature something over the boiling
point of water, inasmuch, as there is a two-fold object
to be accomplished, which is the chemical combination
of soda with the stearic acid, and the driving off of the
398 water which carries the soda. It would furthermore
be obvious to persons skilled in the art that having
stearic acid heated to a temperature above the boiling
point of water the solution would have to be added
gradually and not all at once, otherwise, a very violent
expulsion of the water would take place, which might
cause the material to become expelled along with the
steam.

Q. 229. In the patent in suit, Mr. Macdonald
states that during the time the caustic solution
399 is added to the melted stearic acid the latter
is maintained at a temperature of about 242°
F. and that the "temperature may subsequently
be raised to about 300° F. and continued at
that heat until the water is all expelled" (page 2, lines
46–56). Would such a procedure be a desirable one in
this art, and if not, in what respects would it be
undesirable?

A. It would not be desirable for two reasons, first,
the water would not be completely expelled toward the
400 end of the operation, except with difficulty, because of
the tendency to foam when solution is added to partially saponified material at that temperature, namely,
240° F.: second, after the addition of all of the lye,
the melting point would be raised to such an extent
that there would result a slimy mush, which would
render the operation of foaming off much more tedious.
It is more desirable to allow the temperature to raise
gradually as the caustic solution is introduced, so that
the material is always kept in a good molten condition.
This gradual raising of the temperature is desirable to

accommodate the gradual increase in the melting point 401
of the composition as a whole, due to the gradual increase
in the amount of stearic acid saponified.

Q. 230. Do you consider a temperature of 300° F.
mentioned in the patent in suit to be the most desirable
temperature at which to heat the composition
during the process of manufacturing the same?

A. I do not. I consider it more desirable to heat to
a temperature considerably higher than 300°, as any
impurities which might cause foaming are more rapidly 402
driven off at these high temperatures. The only advantage
in keeping the temperature down to 300° F.
would be in case a very light-colored product was desired,
but in practice the manufacturers prefer a dark
material. The physical properties of the wax foamed
off at the higher degrees are practically the same as
when the wax is foamed off at 300°. By high temperatures,
I mean temperatures around 450° F.

Q. 231. What is now and what always has been the
practice of the defendant regarding the temperature of 403
the caustic and sal-soda solution, when the latter is
added to the melted stearic acid?

A. The solution is cold or, at most, only slightly
warmed, when added to the stearic acid in our practice.
This always has been our practice. After being made
up, it is filtered into vessels which are not provided
with any means of heating and is allowed to stand until
wanted, which sometimes is a day or so after the solution
is made.

Q. 232. In the patent in suit, Mr. Macdonald states 404
that "After the material is molded to the desired form
it should be quickly cooled to ordinary temperatures."
(Page 2, lines 71–73). What is and what always has
been the practice of defendant in manufacturing molded
sound records as described in your patent No. 782,375
of February 14th, 1905, with regard to the cooling of
the cast articles?

A. Our practice is to filter the wax after foaming off
and carry it in a molten state to the wax kettles or
tanks in which the dipping operation is performed.

405 Before adding it to the dipping tank, it is allowed to cool to a temperature of about 290° F. The mold is then dipped in the material and after sufficient thickness has coagulated on the bore of the mold, it is reamed and the mold is put in a water jacket where it becomes sufficiently cool to contract so that it may be withdrawn from the mold. The record as it comes from the mold is at a temperature of about 130° F. and the fall of the temperature to the ordinary room
406 temperature takes place slowly. This always has been our practice in making molded records under my patent.

Q. 233. In letters written by Mr. T. H. Macdonald in whose name the patent in suit was secured, to defendant's witness Melzer, under date of September 11, 1894, and September 19th, 1894, which have been introduced as exhibits for defendant herein, Mr. Macdonald stated that he had attempted to use " stearine, not stearic acid ; " what would be the effect if it were
407 attempted to make this composition by using stearine instead of stearic acid ?

A. The effect would be to produce a composition so full of glycerine that it would be impossible to cast a successful record from it.

Q. 234. Mr. Melzer, in his deposition appears to have some doubt as to the formation of aluminum stearate when aluminate of soda is added to stearic acid in the presence of heat, giving as his reason therefor, the insolubility of aluminum in water, stearic acid,
408 palmitic acid and oleic acid. What, if anything, have you to say, as to the correctness or incorrectness of Mr. Melzer's belief in this respect ?

A. Mr. Melzer is entirely wrong in his statement regarding the formation of stearate of alumina. It is true that stearate of alumina cannot be formed from the metal direct ; that is also true of many other metals, the stearates of which are well known. It is necessary to bring the metals to the form of an oxide or a salt containing an oxide in order to form the combination of stearic acid, such as aluminate of soda, acetate of alum-

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ina, hydrate of alumina and similar salts of lead, nickel,
copper, and magnesium. Metallic lead, copper, mag-
nesium, and nickel are not soluble in water nor in stearic
acid, palmitic and oleic acid, and yet they form me-
tallic stearates, palmitates and oleates, when mixed
with those acids in the form of either oxide or salts
of an oxide. Stearate of alumina is sold as such by
Merck and by other manufacturing chemists and
chemical dealers in this country and abroad. I have
made stearate of alumina by the ton, and have intro- 410
duced a sample in this case (Defendant's Exhibit,
Stearate of Alumina). The chemical formula of
stearate of alumina as given in Mercks 1896 Index
is Al $(C_{18}H_{35}O_2)$ 2. This material contains 4.57%
of aluminum, the balance being stearic acid. It is in-
soluble in alcohol and other well known solvents of
stearic acid, such as gasolene, ether, and acetone, but
dissolves in chloroform and benzole, forming a very
viscid solution, much resembling a solution of rubber
in its viscid nature. This substance will not melt to a 411
liquid, as is the case with stearic acid, but it changes
its structure at a temperature of from 450° to 500° F.
becoming transparent and gummy. It might be
argued that the oxide of alumina acting as an acid in
relation to soda, could not combine with stearic acid,
but this argument loses sight of the fact that alumi-
num oxide in its relation to stearic acid is strongly
basic. In its physical properties, stearate of alumina
is quite distinguished from stearic acid, the former be-
ing absolutely uncrystalizable, and the latter being 412
very readily crystalizable. Stearate of alumina is an
amorphous powder and stearic acid is a crystalline
mass.

Q. 235. In making compositions after the two formulas in the Macdonald patent in suit, will stearate of alumina be formed?

A. Yes, it most decidedly would be formed and is formed. This I am positive of, because I have separated it as such from the wax composition.

Q. 236. What is the chemical valency of aluminum?

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A. It is given as trivalent in the chemical text books. I also know this, because of the formula of its oxide, which is Al_2O_3. The aluminum in this formula takes the place of six atoms of hydrogen, there being two atoms of aluminum, which leaves three atoms of hydrogen replaced by one atom of aluminum. In its relation to hydrogen, therefore, which determines its valency, aluminum is one to three, and is therefore trivalent. If aluminum were bivalent, its oxide would
414 be AlO, whereas if it were monovalent, its oxide would be Al_2O.

Adjourned until tomorrow March 16th, 1906 at 10 A. M.

Orange, N. J., March 16, 1906.

415 Met pursuant to adjournment.

Present: Counsel as before.

The examination of Mr. Aylsworth is continued by Mr. Dyer.

Q. 237. In the Macdonald patent in suit, (page 1 lines 36–57) the specification states:

> 416 "It has been heretofore proposed to use as a sound-recording material an insoluble soap made by saponification of any fatty acid by means of an earthy alkali, such as lime. It has also been proposed to employ a metal, such as lead, combined with stearic or oleic acid, and particularly a mixture of oleate and stearate of lead, but tablets made of insoluble lime-soap or of stearates or oleates of lead have never yielded commercially-successful results. Several practical difficulties have been encountered in endeavoring to make tablets composed wholly or in part of soap. The chief difficulty has been

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> that the surfaces of such tablets become coated after a greater or less length of time with a bluish film having the appearance of mold and which has been termed "efflorescence." This is due to the presence in the material of hygroscopic compounds, which on being attacked by moisture work out to and spread upon the surface of the tablet."

Do these statements correctly define the true condition of the art, as it existed at the date of the application for the patent in suit, namely, November 27th, 1896? 418

A. No, they do not. For more than six years prior to the application of this patent, the art of making phonograph record composition included the use of incompletely saponified stearic acid in combination with stearate of alumina and ceresin, exactly as such blanks are made today by the Edison Phonograph Works. For more than six years prior to the application for the patent in suit the Edison Phonograph Works and the Edison Manufacturing Company made and sold hundreds of thousands of blanks formed of a composition of free stearic acid, stearate of soda, stearate of alumina and ceresin. For more than a year prior to that application, the Edison Manufacturing Company had commenced the operation at Silver Lake with the perfected process using metallic aluminum exactly as blanks are made today at the Edison Works, and this manufacture has been continuously maintained by the Edison Phonograph Works at Orange from the time that the Edison Manufacturing Company gave up the manufacture of blanks at Silver Lake, about June, 1896. When I speak of sales, of phonograph blanks, I have reference to sales in this country, although I understand that many of such blanks were sold abroad. 419 420

Mr. Macdonald evidently supposed at the date of his application that lead in any form was detrimental and necessarily resulted in effior-

421 escence. This is not true, since if very pure stearate of lead is used, very excellent blanks will be obtained which are not efflorescent. Of course, if acetate of lead were employed for the manufacture of the stearate of lead, there would be danger of efflorescence, if the acetic acid set free were not all driven off.

Q. 238. In the patent in suit, (page 1, lines 58–63) Mr. Macdonald says :—

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> I have found that lead in any form, as well as most of the salts of other metals which might be otherwise suitable for the purpose in view, give rise to hygroscopic compounds. This is particularly true of stearates and acetates of lead."

Is it a fact that the use of "lead in any form" gives rise to hygroscopic compounds?

A. It is not, the stearates, oleates and palmitates of
423 lead form insoluble and non-hygroscopic compounds.

Q. 239. Is this particularly true of stearate of lead, as the patent states?

A. It is not true of stearate of lead.

Q. 240. What objections, if any, would there be to acetate of lead?

A. If the acetate of lead were used to form the stearate, it is difficult to drive off all of the acetic acid, and if any free acetic acid remains in the composition, it would result in the formation of efflorescence or
424 mold. This, however, has nothing whatever to do with the absorption of atmospheric moisture which is the pheuomenon attending hygroscopicity ?

Q. 241. Is this objection to the use of acetate of lead encountered in the use of acetates of other metals, for instance, acetate of alumina?

A. It is, as I have stated in previous testimony in the manufacture of composition wherein we use acetate of alumina, we always had difficulty in removing all of the acetic acid.

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Q. 242. In the patent in suit, Mr. Macdonald (page 1, lines 72–76) says :—

> "All ordinary commercial soaps have this tendency to crystalization in some degree, it not being possible to introduce sufficient sodium or soda salt to prevent all crystalization."

Is this statement correct?

A. This statement is not correct, because it is well 426
known that ordinary soaps as manufactured contain a full complement of alkali or 100% saponification. It is well known that the finer grades of toilet soaps, such as Pear's soap, are in no way crystaline, but are perfectly amorphous.

Q. 243. Having reference to the observations in the patent in suit "that the presence of even a small quantity of oleate or oleic acid is detrimental" (page 1, lines 87-88) and that therefore the stearic acid should be "as nearly pure as can be obtained" (page 1, lines 427
83-84) when if ever, did you make these observations?

A. In the summer of 1889, between May and August of that year, I made these observations, and have referred to the same in answer to question 78, under experiments Nos. 1026 and 1027 in my note book No. 565. Under experiment No. 1026 I refer to the fact that "When the hot moist summer weather came, cylinders exposed to it, were badly corroded on the surface" and under experiment No. 1027, I refer to 428
the fact that the "oleic acid, or rather the oleate of soda formed in the wax, was found to be the cause of the wax being affected by moisture" and that the samples of stearic acid obtained from Mitchell & Company, which was thereafter used "were very hard and free from oleic."

Q. 244. Having reference to the observation of the patent in suit, "that the tallow or other source from which the stearic acid is obtained be completely deglycerinized " (page 1, lines 89-91), when if ever, did you make this observation ?

A. Ever since practically the beginning of my experiments, I have known that glycerine in the fatty body to be saponified was objectionable, whether it occurred as free glycerine or combined with the fat. Under date of August 31st, 1888, I made the observation which appears in my note book No. 565, and which I have quoted in full in answer to question 37. I there point out that " the only way left was to use fatty acids and not neutral fats or oils." Stearic acid when of good grade, such as that which we use, is free from glycerine and after commencing the use of stearic acid, I never had any trouble from this cause, except with the case of the stearic acid obtained from Procter & Gamble, which I have testified to in answer to question 132.

Adjourned until tomorrow, March 17, 1906, at 10 A. M.

ORANGE, N. J. March 17, 1906.

Met pursuant to adjournment.

Present : Counsel as before.

The examination of MR. AYLSWORTH is continued by Mr. Dyer.

Q. 245. In the patent in suit (page 1, line 94, to page 2, line 17, Mr. Macdonald says :—

> " In converting the stearic acid into soap, I produce only a partial saponification—that is to say, instead of using the chemical equivalent in caustic alkali of the fat acid I use about forty per cent of that quantity of alkali—thus producing what may be called a soap of about two-fifths saponification. This is the proportion

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> which gives the best results, but is of course
> variable within limits. The controlling con-
> sideration is that the greater the quantity of
> alkali the higher will be the melting point of
> the resulting soap, and a complete saponifica-
> tion will produce a soap which requires to melt
> at a temperature which will char it. As the
> material is to be molded into cylindrical or
> other forms, it must be capable of melting at a
> moderate temperature, say between 250° and 434
> 350° Fahrenheit. On the other hand, if the
> saponification be not carried far enough the
> material will be too soft and will run at a lower
> temperature than is desired."

When, if ever, did you make these observations ?

A. Under experiment No. 857 in note book No. 565
made between August 31, 1888, (date of experiment
No. 853) and December 8, 1888, (the date of experiment
No. 953,) I describe the manufacture of stearate of 435
soda by adding 100 grams of caustic soda (NaHO) to
1000 grams of stearic acid. In order to completely
saponify 1000 grams of stearic acid, it would take
148.6 grams of commercial caustic soda, of which that
of Lewis' is an example. Assuming that the caustic
soda used was 100% pure, the degree of saponification
in this case would be about 67%, but since caustic
soda almost always contains varying proportions of
water up to 20%, the actual saponification would be
somewhat less than this. In my next experiment (No. 436
858), I used 37 parts of caustic soda to 500 parts of
stearic acid, which would give a saponification of
exactly 50%. This experiment was repeated on a
larger scale as No. 867. In experiment No. 871 I added
50 grams of stearic acid to 300 grams of No. 867,
which would reduce the amount of saponification to
somewhat under 50%. This formula, No. 871, was one
of the early standard formulas adopted by the Edison
Phonograph Works. In all the other formulas made
by me and adopted as regular, I retain substan-

437 tially this percentage of saponification, knowing of course that the nearer I approached to complete saponification, the higher would be the melting point, and I always aimed to obtain a composition which would have a melting point low enough to be molded at 300°.

Q. 246. Is the statement in the patent correct that there is a "tendency of sodium and aluminum, when combined to form crystalizable compounds" (page 2, 438 lines 24–26) ?

A. Yes, when we, add hydrate of alumina or metallic aluminum to caustic soda as described in the patent, we obtain a distinctly crystalizable compound, that is to say—aluminate of soda. The crystalline character of this compound does not in any way affect the resulting composition, since the reactions which take place result in the formation of stearate of alumina, which is a very amorphous compound and which corrects the crystalline tendency of the stearate 439 of soda.

Q. 247. The patent in suit states (page 2, lines 22–23) that the "method of introducing the metal is, moreover, important". Is this true ?

A. No, it is not important. The aluminum may be added in many different forms and ways, without effecting any variation in the final product, providing the proportions of alumina in relation to the soda and stearic acid are practically the same. For instance, the stearate of alumina may be separately used and 440 added to the partially saponified stearic acid, as was our practice for many years, at Silver Lake. Or, the acetate of alumina may be added to the stearic acid independent of the caustic soda, either before or after incomplete saponification. Or, the hydrate of alumina may be added to the stearic acid independent of the caustic soda. Or, independently formed aluminate of soda in the dry state may be added to the stearic acid, either before or after saponification. As a matter of fact, it is only when the metallic aluminum is used that it is important to dissolve it in the caustic solution. 441

Adjourned until Monday morning, March 19th at 10 A. M.

ORANGE, N. J., March 21st, 1906.

Met pursuant to adjournment. 442

Present: Counsel as before.

The examination of MR. AYLSWORTH is continued by Mr. Dyer.

Q. 248. Mr. Cameron, complainant's expert, in his deposition (x-Q. 15) in referring to the condition of the talking machine record art in the Fall of 1896, said:

> "Material was not always perfectly amorphous, and there was liable to be present in the composition foreign bodies which would resist the cutting action of the style and cause it to tear or drag out the material, instead of effecting a clean cut. Another difficulty was the fact that it was difficult to avoid the presence of crystalline formations, which were objectionable because the material would cleave or separate along the lines of cleavage of the crystals, rather than along the line corresponding perfectly to the sound wave." 443 444

Is Mr. Cameron correct in this statement of the art, as it existed in the Fall of 1896?

A. No, he is not; the Edison Phonograph Works and the Edison Manufacturing Company, since at least the Fall of 1889, have continuously and in very large quantities manufactured phonograph blanks, which were just as good as blanks made to-day. Since October 1895, these companies have manufactured blanks

445 by the identical process that is now used employing metallic aluminum.

Q. 249. Mr. Cameron, in answer to x-Q. 18, states that in the Fall of 1896, talking machine blanks or records were objectionable inasmuch as "there would form upon the surface of the material a film technically known as 'efflorescence'". Is he correct in this respect?

A. No, he is certainly not correct as regards phono-
446 graph records, because, after we gave up the use of acetate of alumina, and certainly as early as 1890, we had no trouble from efflorescence, and there was nothing in the composition that would effloresce. I do not mean by this to say that when we used acetate of alumina, we encountered difficulties with efflorescence, because I was always careful to drive off all the acetic acid, but there would be danger of efflorescence if the acetic acid was not all driven off. I recall that in one case, some time after the National
447 Phonograph Company was formed in the Spring of 1896, and after we had commenced the use of metallic aluminum, we had a little trouble with one batch of blanks, due to molding, but I found upon investigation that this was caused by impure materials which were sent us.

Q. 250. Have you ever had any experience in connection with patents, and particularly do you understand the object and meaning of the claims of patents sufficiently to enable you to institute a comparison be-
448 tween inventions or alleged inventions, as defined therein, and anticipating, or alleged anticipating, structures, mechanisms and methods, for the purpose of expressing an opinion as to the novelty or lack of novelty of the subjects matter of said claims?

A. While I am not a patent expert, yet, I think I would be able to understand the meaning of claims of a patent, particularly if they related to chemical subjects. I have taken out a number of patents and have had occasion to read a great many patents on chemical and allied subjects. I also keep familiar with patents

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that are issued on chemical and electrical subjects by reading the reports of the same in the technical papers and magazines. I have read the Macdonald patent in suit and I believe I understand the same thoroughly.

Q. 251. What is your understanding of the alleged invention purported to be covered by the first claim of the patent in suit?

A. I should understand this claim to mean the process of making a sound recording material by dissolving any soluble form of aluminum in soda lye, 450 which might mean sal-soda or caustic soda, and adding such solution to stearic acid for the purpose of combining with the same. By stating "any soluble form of aluminum" I mean any form of aluminum which is soluble in soda lye, such as metallic aluminum, or a soluble aluminum salt, or an oxide of aluminum. The claim making no reference to degree of saponification, I would understand it to mean either complete or incomplete saponification, and as no specific temperatures are referred to, I would understand 451 it to cover any desirable temperatures.

Q. 252. When, if ever, did you practice commercially a process for making a sound recording material such as that referred to in the first claim of the patent in suit?

A. I have made many hundreds of pounds of sound recording material by a process which consists in dissolving acetate of aluminum in caustic soda lye, and then adding the same to stearic acid. Acetate of aluminum is a soluble form of aluminum. This was 452 the latter part of 1888 up to about August 1889, when I took up the alum process. This material was made into blanks by the Edison Phonograph Works and sold at that time in this country. Beginning in October, 1895, the Edison Manufacturing Company took up the metallic aluminum process, which since about June 1896 has been continuously carried on by the Edison Phonograph Works. In this process metallic aluminum is dissolved in caustic soda lye and the solution added to stearic acid.

453 Both the acetate of aluminum process and the metallic aluminum process correspond with the process described in the first claim.

Q. 253. What is your understanding of the alleged invention purported to be covered by the second claim of the patent in suit ?

A. I would understand this claim to mean the same
as claim 1, excepting in this claim pure stearic acid
free from glycerine and oleic acid is used, and in the
454 process, the stearic acid is melted before the alkaline
solution is added and the mass is subsequently heated.

Q. 254. What is your understanding of the expression "free from glycerine and oleates" in this claim ?

A. I would understand this to mean stearic acid,
absolutely pure as regards oleic acid and glycerine,
because in the specification between lines 85 and 94,
the patentee states "I have found that the presence of
even a small quantity of oleate or oleic acid is detrimental.
It is also important that the tallow or other
455 source from which the stearic acid is obtained be completely
de-glycerinized. Except under these conditions,
the result will be unsatisfactory."

Q. 255. When, if ever, did you commercially practice a process, such as would be defined by the language of the second claim of the patent in suit ?

A. If the claim is considered literally, as meaning
stearic acid absolutely free from oleic acid and glycerine,
I never practiced such a process either commercially
or experimentally. I have always used and we
456 still use commercial stearic acid, which contains from
2 to 5 per cent. of oleic acid, but which is free from
glycerine. To make the stearic acid free from oleic
acid, would be an extremely expensive process and
would result in a prohibitively costly material. If,
however, the claim means that the stearic acid should
be only substantially free from oleic acid, or free from
an objectionable quantity of oleic acid, I made large
quantities of material by the acetate of alumina process
and by the metallic aluminum process as stated in my

457 answer to question 252 by methods which would be included in the language of the claim as so considered.

Q. 256. What is your understanding of the alleged invention purported to be covered by the third claim of the patent in suit?

A. My understanding of this claim is that it covers a process which is the same as that of the first claim, with two exceptions. In the first place, the third claim is specifically limited to heating the mixture, and in the second place, it is limited to a selection of only 458 enough of the lye to result in a partial saponification of the stearic acid, the percentage of saponification not being stated.

Q. 257. When, if ever, did you commercially practice a process, such as would be included by the language of the third claim of the patent in suit?

A. Both the acetate of alumina process and the metallic aluminum process as described in answer to question 252, correspond with the language of this claim. In practicing those processes, as I have already 459 testified, I aimed to secure a saponification of about 50%, which degree of saponification was determined by the melting point desired.

Q. 258. What is your understanding of the alleged invention purported to be covered by the fourth claim of the patent in suit?

A. I understand this claim to mean the same as the third claim, with two exceptions, first, it is limited to a specified percent of saponification, namely about 40 percent; second, it is not limited specifically to aluminum, 460 but covers any metal that the lye might hold in solution, such, for example, as lead or zinc.

Q. 259. When, if ever, did you commercially practice a process such as would be described by the language of the fourth claim of the patent in suit?

A. The amount of saponification, which would result from the two formulas given in the patent in suit, would as I have previously pointed out, be almost exactly 45%. With the acetate of alumina and metallic aluminum processes referred to in answer to question 252,

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461 the saponification was about 50%. In all respects
these early processes would be comprehended by the
language of this claim. At the present time we use a
saponification of about 50%. I do not remember having
used as low a saponification as 40%.

Q. 260. What is your understanding of the alleged invention purported to be covered in the fifth claim of the patent in suit?

A. I would understand this claim to mean the making
462 of a sound recording material by forming a soda
lye and heating to about its boiling point, adding
thereto a small quantity of aluminum and adding the
solution thus formed and at a temperature
near its boiling point to pure stearic acid,
heated to about the same temperature, and continuing
the heating, until the moisture is
expelled. I understand that where aluminum is referred
to in this claim it means either the metallic
form or a soluble aluminum compound, such as the hydrate
463 or acetate.

Q. 261. When, if ever, did you commercially practice a process, such as would be defined by the language of the fifth claim of the patent in suit, as so understood by you?

A. I cannot say that we ever did commercially practice
a process exactly like that set forth in the claim.
What we have always done, and what is now done, is
to filter the solution after the aluminum has been dissolved,
so that the temperature of the solution falls
464 very considerably below its boiling point. We then
add this solution after filtering to the stearic acid
heated to a temperature considerably above the boiling
point of the solution, and frequently at 300° F. In
some cases, when the solution is added to the stearic
acid, it is quite cold, having stood for a day or two
after filtering. I have already pointed out that it is
absolutely immaterial whether the solution be hot or
cold when added to the stearic acid.

Q. 262. What is your understanding of the alleged

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invention purported to be covered in the sixth claim in the patent in suit?

A. I understand this claim to mean the process of making a graphophone tablet, of which a phonograph blank is an example, by forming a soda lye, heating to about its boiling point and adding thereto a small quantity of aluminum (which would include either metallic aluminum, the oxides thereof, or a soluble salt of the same) adding the solution thus formed to pure stearic acid, heated to about the same tempera- 466
ture, that is—the boiling point of the solution, and continuing the heating until the moisture is expelled and molding into the desired shape and then quickly cooling, which latter step is described in the specification as follows:

> "After the material is molded to the desired form, it should be quickly cooled to ordinary temperatures."

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Q. 263. How does the sixth claim differ from the fifth?

A. In the respect that the subsequent steps of molding and quickly cooling are included.

Q. 264. I direct your attention to the word "pure" in the fifth and sixth claims. What, if any, significance do you attach to this adjective?

A. I understand by this that the patentee refers to the particular kind of stearic acid as described in the specification, namely, stearic acid free from oleic 468
acid and glycerine. As I have before said, we never used stearic acid of this kind.

Q. 265. What is your understanding of the alleged invention purported to be covered by the seventh claim of the patent in suit?

A. I understand this claim to mean the process of making sound recording material by partial saponification of stearic acid with soda lye having aluminum united therewith. This claim is the same as claim 3, excepting that it is not limited to heating the solution, or mixture of the same with stearic acid.

469 Q. 266. When, if ever, did you commercially practice a process such as is described by the general language of the seventh claim of the patent in suit?

A. In carrying out the acetate alumina and metallic aluminum processes, as stated in answer to question 252, and to which I have already testified in detail, I performed operations on a commercial scale that would be described by the general language of this claim.

Q. 267. Would it be possible to make a sound re-
470 cording material without the use of heat? In other words, do the first and seventh claims of the patent describe processes that could be practically carried into effect in this art?

A. No, it would not be possible to make a sound recording composition which could be used in this art without the use of heat as described in the first and seventh claims. It is necessary to make an operative sound recording material that the soap should be anhydrous, and to effect this result continued heating
471 is essential.

Q. 268. What is your understanding of the alleged invention purported to be described in the eighth claim of the patent in suit?

A. I understand this claim to mean the same as the seventh claim, excepting that it is limited to adding the aluminum in the form of aluminic hydrate to the caustic soda lye. This caustic soda lye, I would understand to mean a lye formed of sodium hydrate and not of carbonate or sal-soda. Also, this claim differs
472 from the seventh in that the mixture is heated. This claim is the first that I have so far considered in which specific reference is made to caustic soda, the previous claim being broad enough to include either sal-soda or caustic soda.

Q. 269. When, if ever, did you commercially practice a process such as would be contemplated by the language of this claim?

A. I have never manufactured sound recording material by the method described in this claim, using aluminic hydrate, nor do we use aluminic hy-

473 drate now. In my early work, with sound recording materials, I experimented with aluminic hydrate, but considered it too impure a form of alumina to use, being full of grit, and various salts as impurities.

Q. 270. What is your understanding of the alleged invention, purported to be covered by the ninth claim in this patent?

A. This claim covers the process of making a sound recording material by adding aluminum to soda lye, adding the same to stearic acid, heating the mixture, 474 and adding a softening material, such as paraffine to it. This claim differs from all the preceding claims in that an additional material is added to the composition for the purpose of softening the same, namely, paraffine, or equivalent hydrocarbon.

Q. 271. When, if ever, did you commercially practice a process, such as would be described by the language of the ninth claim of the patent in suit?

A. The acetate of alumina process and the metallic aluminum process, referred to in answer to Q. 252, 475 would both comply with the language of this claim.

Adjourned to tomorrow March 22nd, 1906, at 10 A. M.

ORANGE, N. J. March 22nd, 1906.

Met pursuant to adjournment.

Present: Counsel as before. 476

Examination of MR. AYLSWORTH continued by MR. DYER.

Q. 272. What is your understanding of the alleged invention purported to be covered by the tenth claim of the patent in suit?

A. I understand that this claim covers a composition of matter formed of pure stearic acid, free from oleic acid and glycerine, partly saponified by caustic

477 soda and having incorporated therein aluminum. I understand the stearic acid to be that which is referred to in the specification, namely, one entirely free from oleic acid and glycerine. In the product as defined in the claim, the aluminum would exist as stearate of alumina.

Q. 273. I observe that this tenth claim, which purports to cover a certain composition, is limited to the partial saponification of the stearic acid by caustic 478 soda. If the stearic acid were partially saponified by carbonate of soda or sal-soda, would the composition be any different from one in which the stearic acid was partially saponified by caustic soda?

A. No, there would be no difference whatever in the composition. The final product in both cases would be stearic acid, partly saponified to form stearate of soda, admixed with free stearic acid; together with stearate of alumina. When carbonate of soda, or sal-soda is used, the reaction which takes place liberates 479 carbonic acid gas, which escapes from the composition, resulting in stearate of soda. Likewise, when caustic soda is used, the reaction which takes place liberates water and the product is stearate of soda—exactly the same product in both cases. In place of caustic soda or sal-soda, acetate of soda might likewise be used and form the same product, namely—stearate of soda; in this case the reaction would liberate acetic acid, which would pass off.

Q. 274. When, if ever, did you manufacture a com-480 position, such as would be defined by the language of the tenth claim of the patent in suit, and when to your knowledge was such composition molded into blanks and sold in this country?

A. Ever since we began manufacturing phongraph compositions in 1889, wherein stearic acid combined with soda and alumina was used, up to the present day, we have made compositions which would be described by the general language of this claim. Even previous to the time that we began to use ceresin in the composition and as early as the winter of 1888, 481 the compositions made and sold at Orange at that time by the Edison Phonograph Works, would be defined by the language of this claim, because the claim is not limited to the use of a hydrocarbon and would cover a composition in which no softening ingredients were employed. For instance, formula No. 871 in note book No. 565, was adopted as regular (see note No. 952) sometime previous to December 6th, 1888, and this composition had no hydrocarbon in it.

It is true that in the latter part of 1889 until October 1895, when we used the alum process, carbonate of soda was used to form the stearate of soda, but as I have stated before, there is absolutely no difference between the product wherein the carbonate of soda was used and that formed wherein the caustic soda was used. 482

Q. 275. What is your understanding of the alleged invention purported to be covered by the eleventh claim of the patent in suit?

A. My understanding of the eleventh claim is that it covers a process of making a sound recording material by adding aluminate of soda to stearic acid and heating the mixture. Aluminate of soda is a well-known compound and can be made by adding hydrate of alumina to caustic soda or by dissolving metallic aluminum in caustic soda, or by adding alum, or any other soluble combination of aluminum to caustic soda, such as the acetate, or adding any of these to the carbonate of soda. In the case, however, of hydrate of alumina, if we are dealing with solution, the hydrate would not form aluminate of soda when added to carbonate alone. If, however, the hydrate of alumina is added to the carbonate of soda, and the same heated to a sufficiently high temperature, aluminate of soda will result. Aluminate of soda is a crystalline powder. 483 484

Q. 276. When, if ever, did you practice commercially a process such as would be defined by the general language of the eleventh claim of the patent in suit?

A. From the latter part of 1888 to the latter part of

485 1889, when we used the acetate of alumina process, and from October 1895 until the present time, during which we have used the metallic aluminum process, as I have already testified to in answer to question 252.

Q. 277. Is aluminate of soda (a compound of alumina and soda lye) a common saponifier in the soap-maker's art?

A. Aluminate of soda has been suggested as a saponifier in this art.

486 Q. 278. Is stearic acid a common source of fat material in the soap-maker's art?

A. It is a very common material in this art.

Q. 279. Kindly indicate an example, showing the use of aluminate of soda, as a saponifier in the soap-maker's art?

A. An example of this is found in patent to Pemberton, No. 53,865, dated April 10th, 1866. In the specification of this patent, the patentee states—

> 487 "The use of the aluminates of soda or potash in the manufacture of caustic alkalies, either with or without the admixture of the hydrates of those alkalies, is a great improvement on the employment of the hydrates alone. The advantages resulting from my improvement are, first, the superior cleanliness, whiteness, and purity of the soap manufactured with caustic alkali made in whole or in part with aluminate of soda or potash." (Page 1, second column,
> 488 to page 2 line 5)

Pemberton forms aluminate of soda by decomposing cryolite with lime. Cryolite is a mineral substance composed of fluorides of soda and aluminum. The resulting aluminate of soda, however, is exactly the same as when the aluminate is made by dissolving alumina or metallic aluminum in caustic lye. Pemberton suggests the use of aluminate of soda with the admixture of the hydrate of soda or caustic soda, which would be precisely

489 the saponifier described in the patent in suit. If such a saponifier were added to stearic acid (a common source of fat material) and if the degree of saponification were properly adjusted, the resulting soap would be as satisfactory as sound recording material as that suggested in the patent.

Q. 280. Do you find in this Pemberton patent a disclosure of a process sufficiently comprehensive to include any of the claims of the patent in suit?

A. The first and eleventh claims, not being restricted 490 to any degree of saponification, are in terms just as applicable to the description in the Pemberton patent as to the Macdonald patent. The second claim if limited to stearic acid, absolutely free from oleic acid would probably not apply to the Pemberton patent, because stearic acid of such a form would be very uncommon and would probably have to be made in the Laboratory at great expense. If, however, the second claim relates only to commercially pure stearic acid, that material long before the date of Macdonald's patent, was 491 a common source of fat in soap manufacture, and the second claim as so considered would apply just as effectively to the Pemberton patent, as to the Macdonald patent.

> Counsel for Defendant offers in evidence copy of patent to Pemberton, No. 53,865, and the same is marked "Defendant's Exhibit Pemberton Patent."

492

Q. 281. Kindly compare on the same basis of stearic acid, the formula set forth in your patent No. 782,375 of February 14th, 1905, which complainant's expert, Mr. Cameron, regards as an embodiment of the alleged invention of the patent in suit, with the two formulas of said Macdonald patent, and also include the same as a part of "Defendant's Exhibit Comparative Statement"?

A. On a basis of 408 lbs. of stearic acid, Macdonald

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A formula, compared with my formula would disclose the following:—

Macdonald *A*		Aylsworth
408 lbs.	Stearic acid	408 lbs.
27.2 lbs.	Caustic soda	4.08 "
None	Sal-soda	87.7 "
2.42 "	Aluminum in terms of metal	1.61 "
72 "	Ceresin	47.2 "
None	Carnauba	87.2 "

494

Note: Total alkaline contents of Aylsworth composition expressed in terms of caustic soda—28.6 lbs.

Percentage of saponified stearic acid, Macdonald 44.9%, Aylsworth 47.2%.

Comparing Macdonald formula B, with the formula in my patent, I find the following:—

Macdonald *B*		Aylsworth
408 lbs.	Stearic acid	408 lbs.
2.04 "	Metallic aluminum	1.61 "
3.9 "	Caustic soda	4.08 "
81.6 "	Sal-soda	87.7 "
72 "	Ceresin	87.2 "
None	Carnauba	87.2 "

495

Percentage of saponified stearic acid:
Macdonald 44.1%
Aylsworth 47.2%

In accordance with your request I have added these
496 comparative figures in next to the last column of
"Defendant's Exhibit Comparative Statement."

Q. 282. Kindly also prepare a comparative statement showing the relation between the formula referred to by defendant's witness, Storms, in answer to question 17, and the two formula of the Macdonald patent in suit?

A. On a basis of 408 lbs. of stearic acid, a comparison between the formula given by Mr. Storms and formula A of the Macdonald Patent in suit, would show the following:

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Macdonald *A*		Storms
408 lbs.	Stearic acid	408 lbs.
27.2 "	Caustic soda	4.1 "
None	Sal-soda	91.8 "
2.42 "	Aluminum in terms of metal	1.61 "
72 "	Ceresin	73.4 "

Note: Amount of total alkaline contents of Storms formula, expressed in terms of caustic soda 29.8 lbs. 498

Percentage of saponified stearic acid:

Macdonald 44.9%
Storms 49.2%

Comparing Macdonald's formula B with that of Mr. Storms, I find the following:

Macdonald *B*		Storms
408 lbs.	Stearic acid	408 lbs.
3.9 "	Caustic soda	4.1 "
81.6 "	Sal-soda	91.8 "
2.04 "	Metallic aluminum	1.61 "
81.6 "	Ceresin	73.4 "

499

Percentage of sponified stearic acid:

Macdonald 44.1%
Storms 49.2%

In accordance with your request I have added the figures regarding the Storms' formula in the last column of "Defendant's Exhibit, Comparative Statement."

Q. 283. Kindly prepare a comparative statement, 500 showing the relation between the Edison formula "as coming from the E people," referred to in letter of September 21, 1896, to defendant's witness Melzer, and forming part of "Defendant's Exhibit Selected Portions of Macdonald-Melzer Correspondence," with the formula stated by Mr. Storms to have been practiced by him in complainant's factory, on a basis of 100 lbs. of stearic acid?

501

Edison Formula as given by Macdonald.		Edison Formula as given by Storms.
100 lbs.	Stearic acid	100 lbs.
453 grams	Caustic soda	458 grams.
23 lbs.	Sal-soda	22.5 lbs.
184.2 grams	Metallic aluminum	175 grams.
Not given	Ceresin	18 lbs.

Q. 284. If the alumina in formula A of the Macdonald 502 patent in suit were expressed in terms of the metal, what would be the mean between the same and the amount of metallic aluminum which Mr. Macdonald, in his letter of September 21st, 1896, to Mr. Melzer, assumes to have been used by Mr. Storms, namely—6½ ounces to 100 lbs. of stearic acid?

A. If the alumina contents of Macdonald Formula A are figured in terms of metallic aluminum, the amount thereof will be 2.42 lbs. as compared with 1.63 lbs. for the Storms' formula, as Mr. Macdonald understood the 503 same. On a basis of 300 lbs. of stearic acid, the mean of these figures will be 1.5 lbs. which is the amount given by Mr. Macdonald in connection with formula B. In other words, in formula B, the amount of metallic aluminum suggested by Mr. Macdonald is exactly half-way between the amount used in formula A and the amount of metallic aluminum which Mr. Macdonald stated to Mr. Melzer he understood Storms to use.

504 Adjourned until tomorrow, March 23, 1906 at 10 A. M.

505

ORANGE, NEW JERSEY, March 27, 1906.

Met pursuant to adjournment.

Present: Counsel as before.

EXAMINATION OF MR. AYLSWORTH IS CONTINUED BY MR. DYER:

Q. 285. Having reference to your note books, numbered respectively 50, 533, 564, 565, and 1000, please 506
state whether these note books are in your handwriting?

A. They are, with the exception of one note of Mr. Edison's and one of my wife's, concerning which I have already testified.

Q. 286. Having reference to the "Useful Data" formula, which appears on the last page of note book No. 565, kindly explain what this refers to? I have reference to the latter part of this entry, relating to aluminate of soda. 507

A. At the time this useful data was written, it was possible to buy aluminate of soda as such in the dry state, and I thought of using the same in making the wax and in order to do this, the proportions were figured out and came as are indicated on this page.

Q. 287. Did you ever make any wax composition according to this formula, using aluminate of soda?

A. I did; I made one or more batches on a large scale, I think in the latter part of 1890, or possibly
earlier. . At any rate before I left the laboratory to go 508
to Jersey City.

Q. 288. How would the formula using aluminate of soda compare with the other formula given in your useful data entry?

A. It would be exactly the same in percentage of alumina and in the other ingredients.

Q. 289. When was this reference to the use of aluminate of soda entered in your note book No. 565?

A. I think it was before I went to Silver Lake, but

509 it was certainly before I left Silver Lake and went to Jersey City.

Q. 290. Did you ever disclose to any one this formula, using aluminate of soda?

A. Yes, this formula and data were given to Walter Miller at the time I left Silver Lake and went to Jersey City. You understand that I was not at Silver Lake all the time, but was really employed at the Laboratory, going to Silver Lake from time to time when
510 necessary.

Q. 291. I direct your attention to "Defendant's Exhibit, Aylsworth-Miller Note No. 1" and ask if you ever saw the same before, in whose hand-writing it is, and what it refers to?

A. I positively identify that as my own handwriting and I recognize my spelling. This is a formula which I turned over to Mr. Miller at the time that he took up this work early in 1891. The pencil notes on this sheet are in Mr. Miller's handwriting.

511 Q. 292. Kindly explain the formula given on this sheet?

A. This formula is the same as the "Useful Data" formula, given in the back of note book No. 565, with respect to its contents of Sal-soda and stearate of alumina. In addition this formula contains an addition of scrap wax, which is essentially 3 parts of filtered scrap wax to 1 part of new wax. The scrap wax mentioned is some in which a larger percentage of ceresin was used, and in order to use this material, it was
512 necessary to make up and mix therewith a portion of new wax containing no ceresin, which when mixed made the desired percentage of ceresin in the wax, namely 12.8%.

Q. 293. Referring to "Defendant's Exhibit, Aylsworth-Miller Note No. 2," can you identify the same and if so, please state in whose handwriting this note is written, and also if possible, what it refers to?

A. I identify this note as being in my hand-writing and recollect that it was written at the same time as the previous note on which I have just testified, which

513
was data and instructions for Mr. Miller's use in making the wax. This note refers to pointers which I had learned by experience and which it was necessary for Mr. Miller to know. For instance, the smallest charge of wax which it was advisable to make in a kettle was mentioned, giving the reasons why a smaller charge should not be used. Also, the best charge to make is mentioned, with a formula and directions for the same.

Q. 294. I ask the same question regarding "Defendant's Exhibit, Aylsworth-Miller Note No. 3"? 514

A. I recognize this sheet also as being in my handwriting, and as being part of instructions which I gave to Mr. Miller early in 1891. This note relates to the manufacture of stearate of alumina as I had been making it at Silver Lake before Mr. Miller came there. This note gives the quantity of material for making the stearate of soda, from which the stearate of alumina was formed by adding to the solution of the same, a solution of alum.

Q. 295. I show you voucher of the Edison Manufacturing Company, No. 590, dated October 31st, 1895, and ask if you can identify the bills or memoranda attached to the same? 515

A. I identify these as being my expense accounts as handed in on October 25th, 1895. This represents the first purchase of metallic aluminum made by me. The bills attached to my expense account are referred to in the account. One of them being a cash memorandum of the purchase of eight ounces of aluminum bronze powder. I recollect very well that I went in to New 516
York and purchased the aluminum bronze powder myself from the Pittsburgh Reduction Company.

> Counsel for Defendant offers in evidence the voucher referred to by the witness and the same is marked "Defendant's Exhibit, Aylsworth-Aluminum Voucher".

Q. 296. I show you voucher No. 723, of the Edison Manufacturing Company for November 1895, and ask

517
if you can identify the same, and if so, kindly explain the meaning of the expression "No. 2 Ingredient?"

A. I recognize the bills attached to this voucher as referring to the purchase of aluminum from the Pittsburgh Reduction Company. I notice that one of them is O. K.'d by myself. The bill which refers to "No. 2 Ingredient" is one for sheet aluminum, which I recollect was the first purchase of the sheet material for use in making the wax.

518

Counsel for defendant offers in evidence the voucher referred to by the witness and the same is marked "Defendant's Exhibit, Aylsworth Sheet Aluminum Voucher".

Q. 296½. Have you had occasion to analyze any records or blanks, which you can state positively were manufactured by you or under your direction by the Edison Phonograph Works, or Edison Manufacturing Company prior to the year 1893? 519

A. I have analyzed a number of records, and from the analysis identify the same as being records manufactured from early formula as given in "Defendant's Exhibit, Comparative Statement".

Q. 297. Where and when did you obtain the records and blanks which you analyzed?

A. These records were obtained from Mr. Wangemann on January 2nd, 1906, and were marked in the presence of Mr. Dyer snd Mr. Wangemann immediately after opening the case in which they were packed, a portion of each of these records was cut off at one end and was analyzed by me, the remaining portion of each record being still in my possession. 520

Q. 297½. Please produce the remaining portions of the records referred to in your last answer?

A. I herewith produce the remaining portions of the records analyzed by me, and on which I have scratched the numbers from 1 to 6 inclusive.

521

Counsel for defendant offers in evidence the portions of the records produced by the witness and the same are marked "Defendant's Exhibit, Aylsworth Records No. 1, 2, 3, 4, 5 and 6."

Q. 298. Can you produce a statement, showing the analysis of these records, portions of which have just been introduced?

A. I can, and herewith produce this statement.

522

The statement produced by the witness offered in evidence and marked "Defendant's Exhibit, Statement of Aylsworth Analyses".

Q. 298½. I observe that this statement of analysis that you have produced appears to give the results of the analysis of seven records; what do the figures in the seventh column refer to?

A. They refer to the analysis of a Columbia blank which was purchased at their store in Newark in January of this year. 523

Q. 299. Does your analysis of the Columbia blank show the presence of any oleic acid in defendant's composition?

A. It does, it shows the presence of 2.46% of oleic acid.

Q. 299½. How are you able to say with certainty that the blanks or records analyzed by you, the results of which are given in the first six columns of "Defendant's Exhibit, Statement of Aylsworth Analyses" were in fact, made prior to 1893? 524

A. By the coincidence of the percentages of the various ingredients with the formulas in use at different times prior to 1893.

Q. 300. Take for instance, the analysis in the first column of cylinder No. 1, with what formula do you identify this analysis?

A. This analysis corresponds very closely with the "Useful Data" formula as given to Mr. W. H. Miller, at the time he took charge of the wax making in 1891.

525

Converting the proportions of the ingredients in the analysis in terms corresponding to the formula, in the comparative statement, we would have the following :—

Useful Data Formula		Formula from Analysis of No. 1
408 lbs.	Stearic acid	408 lbs.
None	Oleic acid	12.4 lbs.
29.12 "	Caustic soda	28.2 "
526 2.78 lbs.	Metallic aluminum	2.45 "
47.7 "	Hydrocarbon	60.1 "
	Percentage of stearic acid saponified—Useful Data	48.1%
	Formula from analysis of No. 1	46.5%

Q. 300½. Please consider the analysis in the second column and state with what formula you identify the same?

A. The second column refers to the record No. 2, and the analysis of the same corresponds also very
527 closely to the Useful Data formula. The useful data formula which I referred in these two answers had a variable quantity of ceresin. At first the percentage of ceresin was about 18%, and was later reduced to 12%. The formula of 12% was the one that was practiced by Mr. Miller when he took hold of the work early in 1891. The comparison of the two, that is, the analysis of No. 2 and the Useful data Formula is as follows:

528

Useful Data Formula		Formula from Analysis of No. 2
408 lbs.	Stearic acid	408 lbs.
29.12 lbs.	Caustic soda	28.2 "
2.78 "	Metallic aluminum	2.47 "
47.7 "	Hydrocarbon	47.18 "
48.1%	Stearic acid saponified	47.8%
None	Oleic acid	14.6 lbs.

Q. 301. Please consider the analysis in the third column and please state with what formula you associate the same?

529

A. The analysis of No. 3 record is included in the the third column and corresponds very closely with the formula in use at Silver Lake for making wax from 1889 to 1895 with 12% ceresin, that is the Useful Data formula:

Useful Data Formula.		Formula for Analysis No. 3.
408 lbs.	Stearic acid	408 lbs.
None	Oleic acid	12.6 "
29.12 lbs.	Caustic soda	28.77 "
2.78 "	Metallic aluminum	2.14 "
47.7 "	Hydrocarbon	57 "
48.1%	Stearic acid saponified	47.5%

530

Q. 302. Please consider the analysis in the fourth column and please state with what formula you associate the same?

A. The analysis of No. 4, which corresponds very closely to the formula No. 1046 of the Comparative Statement. 531

No. 1046.		Formula from Analysis No. 4.
408 lbs.	Stearic acid	408 lbs.
None	Oleic acid	9.8 "
31.8 lbs.	Caustic soda	31.07 "
2.6 "	Metallic aluminum	2.39 "
113.7 "	Hydrocarbon	140.9 "
52.5%	Stearic acid saponified	51.3%

532

Q. 303. Please consider the analysis in the fifth column and please state with what folmula you associate the same?

A. This refers to the analysis of record marked "No. 5," and corresponds very closely with the formula No. 871 of the Comparative Statement:

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Formula No. 871.		Formula from Analysis No. 5.
408 lbs.	Stearic acid	408 lbs.
None	Oleic acid	24.2 "
32 lbs.	Caustic soda	30.8 "
2 "	Metallic aluminum	1.82 "
None	Hydrocarbon	None
52.8%	Stearic acid saponified	50.9%

534 In the formula No. 871 acetate of alumina was used as the source of alumina, the amount being 12.6 lbs. The metallic aluminum of the analysis formula converted to the acetate gives 11.5 lbs. of acetate of alumina.

Q. 304. Please consider the analysis in the sixth column and please state with what formula you associate the same?

A. This relates to the analysis of the record marked
"No. 6" and corresponds very closely to formula No.
535 871 of the Comparative Statement:

Formula No. 871.		Formula from Analysis No. 6.
408 lbs.	Stearic acid	408 lbs.
None	Oleic acid	22.8 "
32 lbs.	Caustic soda	31.6 "
2 "	Metallic aluminum	2.05 "
None	Hydrocarbon	None
52.8%	Stearic acid saponified	52.2%

536 The acetate of alumina used in formula No. 871 was 12.6 lbs. and the aluminum in the formula from Analysis No. 6 converted to the acetate would amount to 13 lbs.

In all of these formula resulting from the analyses, oleic acid is given, and varies from 9.8 to 24.2 lbs. This amount of aleic acid represents the amounts which are found in the stearic acid of commerce, and would represent a variation of from 2 to 6 per cent. In the earlier grades of stearic acid used, the percentage of oleic acid frequently amounted to about 6%.

Q. 305. Do I understand from the comparisons given

537
in your answers to questions 299 to 304 inclusive, that
in the case of your analyses there was always present
oleic acid, while in the case of the earlier formulas with
which you compared those analyses, there was no oleic
acid?

A. No, in the early formula mentioned, no oleic acid
was used as a separate addition, but those formula all
contain oleic acid varying from 2 to 6% on account of
the stearic acid as obtained in commerce, containing
that amount of oleic. 538

Q. 306. Then, as I understand it, in making these comparisons, it would be entirely fair to omit the oleic acid altogether?

A. It would.

Q. 307. Does the fact that in the comparisons instituted by you between formulas based on your analyses
and the original formula referred to in "Defendant's
Exhibit Comparative Statement," the figures do not
precisely correspond in every case, influence in any way
your opinion as to the identity of the formulas in the 539
several instances?

A. I would expect small variations in a comparison
of this kind, because the formulas are based on a 100%
pure ingredient, and as a matter of fact, the various
commercial ingredients used in this formula are somewhat less than 100 per cent pure. Therefore, the proportions as shown by the formula would, generally
speaking, be somewhat higher than a formula of the
same as shown by analysis. If they were not so, I
would not consider the comparison a fair one. An 540
additional help toward identification of these records
is found in the small percentage of lead found in No. 1,
2, 3 and 4. These percentages are .13, .12, .12 and .07.
The presence of this lead is derived from the kettles in
which the composition was made. The absence of
lead in No. 5 and 6, together with the absence of
hydrocarbon positively to my mind, indentifies these
records as being made previously to 1891, because
the records as made at that time were made in
lead lined kettles and contained ceresin, and it

541 was only from the latter part of 1888, during the part of 1889 that the composition No. 871 was made, which contained no ceresin. This composition was made entirely in iron kettles.

Q. 308. Entirely apart from the analyses of the six records or blanks, which were analized by you, and of which you have produced a portion, can you state from an examination of these records whether they were made prior to 1893 and whether they are of
542 compositions identical with those made by the Edison Manufacturing Company or the Edison Phonograph Works, molded into blanks or records, and sold commercially prior to 1893?

A. Yes, I can identify these as being made prior to 1893, because of the manner of making the blanks, as seen in records, Nos. 4, 5 and 6. I also observe that these records, Nos. 5 and 6 especially, must be very old because when cut into it is seen that there is a change of color, the outside being of a salmon color and a
543 small portion of the interior or middle is the original color of the cylinder. This change in color I am familiar with and know the cause to be the gradual absorption of oxygen, which causes the stearate of iron which the record contains as an impurity derived from the iron kettles, to change to the ferric or higher oxidation stage, which produces a brownish or salmon color. It would take years for the action to penetrate to the depth which it has in these two records. I observe that since the records were cut to take the
544 sample for analysis early in January up to this time, there has been no perceptible change in the lighter interior portion; the age of a composition of this kind could be fairly accurately determined by the depth of discoloration. These records are the same composition as was manufactured previous to 1893 by the Edison Manufacturing Company and Edison Phonograph Works, and which were molded into records and blanks and sold commercially.

Q. 309. I show you twelve records, which were introduced as exhibits on behalf of defendant follow-

545 ing answer to question 71 in the deposition of defendant's witness Wangemann and ask if you can identify these as being records identical with those commercially sold in this country by the Edison Phonograph Works or Edison Manufacturing Company prior to 1893?

A. I do identify them as being the same as those commercially manufactured and sold in this country by the Edison Manufacturing Company and Edison Phonograph Works prior to 1893. 546

Q. 310. Can you produce any records made by the Edison Manufacturing Co. or the Edison Phonograph Works prior to 1893 and which you have had continuously in your possession since that time?

A. Yes, I produce eight records which I have had continuously in my possession prior to 1893. These records, however, were damaged by fire on February 8 of this year, as my laboratory was partly burned on that date. Two of these records I have shaved partly off to show the very perfect character of the material. 547

Q. 311. During the twelve or more years which these records have been in your possession, did they ever show any tendency to effloresce or mold?

A. They did not; prior to February 8th, when they were damaged, they were in good condition, and these records I have reproduced as recently as January of this year in the presence of Mr. Dyer and Mr. Wangemann.

Q. 312. Up to the time of the fire in your Laboratory, how did these records which you have produced 548 compare with modern blanks made by the complainant and the Edison Phonograph Works?

A. They are the same in their properties of record taking and in the texture and composition, as those made to-day by the Edison Phonograph Works.

Q. 313. Do you recall the circumstances under which these records came into your possession prior to 1893?

A. I recall that the records were obtained from stock as made prior to 1893.

549

Q. 314. What do you mean by "from stock" in the above answer?

A. The records were obtained from the Record-taking Department, when it was located in Room No. 13 of the Edison Laboratory. In this Department there were many hundreds of records manufactured and shipped prior to 1893, and out of these records there were always a number which were not absolutely perfect as to the record and it was my recollection that 550 these records were given to me because of this fact. Prior to this date I recollect seeing large quantities of blanks from which these records were made in the stock room of the Phonograph Works. From this stock the blanks upon which the records were manufactured in the Laboratory were obtained, and there were always several hundred of them undergoing the operation of preparation for taking the record and those on which records had been taken.

551 Of the several original records produced by the witness, two of them with their surfaces partly shaved off, are offered in evidence and marked "Defendant's Exhibit, Aylsworth Original Record No. 1" and "Defendant's Exhibit, Aylsworth Original Record No. 2."

CROSS-EXAMINATION BY MR. MASSIE:

x-Q. 315. Prior to the first of April, 1905, the defend- 552 ant was putting out molded records, and was also making use of masters that were not molded records, was it not?

A. Yes.

x-Q. 316. The defendant was likewise putting out blanks for commercial machines was it not?

A. I don't know about that.

x-Q. 317. Speaking generally, were the blanks for the master records made of the same composition and by the same process as the molded records?

A. Essentially the same, with the exception of slight

553 variations in the proportions, and the addition of one ingredient, namely, the carnauba wax.

x-Q. 318. The defendant is at the present time putting out blank cylinders for dictation purposes, but you are not now able to say whether this is true of the time previous to April 1st, 1905 ?

A. Yes, I believe they are now putting out blanks for the commercial machine, but I don't know just how long they have been putting out those blanks.

x-Q. 319. Are these blanks, again speaking generally, 554 of the same composition and made by the same process as the molded records and the original masters ?

A. They are made of essentially the same composition and by the same process as the original masters.

x-Q. 320. Do I correctly understand that the Aylsworth Comparative Statement gives a complete statement of the successive developments, which lead to the composition and processes, employed by defendant in 1905 ? That is, is there any composition that was used by defendant in manufacturing cylinders for 555 sale, which is not set out in the Aylsworth Comparative Statement ?

A. The several formulas which I give in "Defendant's Exhibit Comparative Statement" are, as I now remember and without referring in detail to my note books, the important formulas that were developed from time to time. Of course there were changes made more or less from time to time in the different proportions of ingredients, but which were not material. The two considerable changes which were made were, first, 556 when the alum process was substituted for the acetate of alumina process, and second, when the metallic aluminum process was substituted for the alum process.

x-Q. 321. Since the Fall of 1895, the defendant has used formula No. 38 exclusively, without any material change and has used the process which you describe in connection with that formula ?

A. Yes.

x-Q. 322. And since some time in 1890 at Silver Lake, down to the adoption of formula No. 38, defend-

557 ant followed the "Useful Data" using that formula exclusively without any material change, and following the process you have described in connection therewith?

A. Yes, so far as I know.

x-Q. 323. The differences between those two formula, namely the "Useful Data" and No. 38 were due to yourself and not to others; that is, if the change amounted to invention, you were the inventor?

558 A. I made the experiments which resulted in the changes while in the employ of the Edison Phonograph Works; they were of course entitled to the invention, but I was the inventor.

x-Q. 324. Prior to the adoption of the formula of the "Useful Data," the defendant employed for a year or less exclusively, formula No. 1058, and the process described by you in connection therewith, did it not?

A. This formula No. 1058 was in use from sometime in August 1889 to the latter part of October or
559 later in 1889. This formula, in fact, is almost identical with the Useful Data formula. I cannot say positively whether No. 1058 was used exclusively, because we used all sorts of compositions in the early days of which I have no record in my note book, although they were, of course of the same general composition. One of these was the aluminate of soda formula, forming part of the "Useful Data".

x-Q. 325. What formula and process was defendant using immediately prior to the adoption of the "Use-
560 ful Data" at Silver Lake in 1890?

A. The one immediately prior to the Useful Data formula was No. 1058, which is almost identical with it and on which it is based.

x-Q. 326. In view of your answer to x-Q. 324, I will ask you did the Useful Data entirely supplant its predecessors, and did formula No. 38 subsequently, entirely supplant all other formula?

A. The Useful Data formula did supplant the previous formula, and No. 38 supplanted the Useful Data

561 formula, but these transformations from one formula to another extended through a number of weeks.

x-Q. 327. Prior to the use of formula 1058, what formula and process were used by defendant in manufacturing cylinders for sale ?

A. No. 1046, which differed from 1058 in that no carbonate of soda or sal-soda was used and the percentage of ceresin was considerably larger. In No. 1046 caustic soda was the form of soda used.

562 x-Q. 328. The differences between 1046 and 1058 were made by yourself alone ; that is, if there were any invention in 1058 over 1046, you were the inventor ?

A. This formula No. 1046 was changed by me with the approval of Mr. Edison, who passed on all such matters.

x-Q. 329. But you were the one who first pointed out these differences to Mr. Edison, were you not ?

A. Yes.

563 x-Q. 330. In the same way, the differences or variation or changes from No. 1058 to the Useful Data were made by yourself ?

A. Yes.

x-Q. 331. Prior to the adoption of No. 1046, which formula and process were used by the defendant in manufacturing its cylinder for sale ?

A. Prior to the use of No. 1046, No. 957 was used.

x-Q. 332. After No. 957 had been adopted, did it supplant all other formula and processes used by defendant ? 564

A. This particular formula No. 957 was not in use a very long time, as I recollect this is the one which gave us some trouble and it was found necessary to chance it, as I have already testified to.

x-Q. 333. And as before, you were the one who made the changes and thereby developed No. 1046 ?

A. Yes, with the approval and suggestion of Mr. Edison.

x-Q. 334. As I understand your answer, and other recent answers naming Mr. Edison, the question

565 whether or not a certain formula should be adopted and used was a matter for his determination. Do you mean in addition to that that Mr. Edison in any way participated in developing the changes ?

A. Yes, Mr. Edison had a great deal to do with the development of the changes in the way of suggestions which I carried out for him.

x-Q. 335. That is, if the differences between formula 957 and the process explained in connection therewith
566 on the one hand, and formula 1046 and its process on the other hand, amount to invention, you were not the sole inventor, but you and Mr. Edison together, were the joint inventors ?

A. I should say that if there was any invention in leaving out the oleic acid and substituting the stearate of alumina for the acetate of alumina and adding the ceresin, that the work was jointly done by myself and Mr. Edison.

x-Q. 336. Have you obtained or applied for a patent
567 on any of the formula, 1046, 1058, "Useful Data," or 38 ?

A. No, not so far as I know.

x-Q. 337. Have you obtained or applied for any such application jointly with Mr. Edison ?

A. No.

x-Q. 338. Why have you refrained from applying for a patent on any of these formula or processes ?

A. Because it was Mr. Edison's intention to keep these wax formula a trade secret, and they were
568 guarded and great care taken for a long time to prevent these formula from becoming known to outsiders.

x-Q. 339. Prior to the adoption of No. 1046, I understand that No. 957 was tried for a while, rather than being actually adopted and used to any great extent ? What formula, if any, was used regularly used by defendant in making cylinders for sale prior to 1046 ?

A. No. 957 was adopted and used for a short time, as I said before, and prior to that No. 871 was in use, also, No. 858, which are very nearly the same.

569 x-Q. 340. Who so far as you know, first suggested to you the use of acetate of alumina; or did you originate this suggestion yourself?

A. It is my recollection that I myself thought of and tried the acetate of alumina. I, however, recollect that Mr. Edison made some stearate of alumina by mixing the chloride of alumina with stearic acid and heating it to quite a high temperature.

x-Q. 341. Was that work of Mr. Edison's done before or after you made use of the acetate of alumina? 570

A. Before.

x-Q. 342. Was the stearate of alumina, which Mr. Edison made before you employed acetate of alumina employed in manufacturing cylinders for sale?

A. No, not in the manner that he made it.

x-Q. 343. Before defendant used formula 858, or 871, and the process it described in connection therewith, what formula, if any, was employed by defendant in manufacturing cylinders for sale?

571 A. No. 858 is the earliest formula used for the manufacture of cylinders for sale. There was, however, a formula in use for experimental purposes in the factory, and laboratory prior to 1888, which was the carnauba and ceresin formula, to which I have previously testified.

x-Q. 344. Have you obtained or applied for any patent or formula 858 or 871, or the processes described in connection therewith?

A. No.

572 Q. 345. For the same reason already stated with regard to the later formula, namely, to retain the same as a trade secret?

A. Yes.

x-Q. 346. The composition of No. 858 or No. 871 may be described as a "two-metal soap", may it not?

A. Yes, it might be considered a two-metal soap.

x-Q. 347. So far as you know, are formula 858 and 871, the earliest two-metal soaps employed for phonograph cylinders?

A. Yes, if you mean commercially.

573 x-Q. 348. Any earlier two-metal soap employed for phonograph cylinder material was used in the Laboratory only, is that what you mean ?

A. Yes, we made a large number of metallic soaps and combinations of the same in the Laboratory.

x-Q. 349. What do you mean by "metallic soaps ?"

A. The union of a metallic base or oxide with a fatty acid. I think the term "metallic soap" refers to insoluble soap. However, strictly speaking, a compound 574 of any metal, such as sodium with a fatty acid, would be considered a metallic soap. In my testimony where I have referred to a metallic soap, I mean an insoluble soap.

Adjourned until Thursday morning March 29th at 10.30.

575 ORANGE, N. J., April 2, 1906.

Met pursuant to adjournment.

Present : Counsel as before.

Cross examination of MR. AYLSWORTH continued by Mr. Massie :

x-Q. 350. I notice in your formula given in your Comparative Statement, there is incomplete saponification of the stearic acid (and its attendant-palmitic acid). 576 Who first suggested this ; that is, if incomplete saponification of stearic or other fatty acid in producing a composition for phonograph cylinders amounted to invention, were you the inventor ?

A. I don't recall whether or not Mr. Edison suggested partial saponification, but it is my impression that he suggested making and using stearate of soda alone, and as it would be impossible to make stearate of soda in fit condition to mold into a tablet for the phonograph without incompletely saponifying it, I would conclude that the invention, if there was any,

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577
would go with the suggestion of the use of the stearate of soda.

x-Q. 351. In formula 957, there is employed an appreciable amount of oleic acid, and I understand that you found this objectionable. Who first pointed out, so far as you know, that the presence of an appreciable amount of oleic acid is objectionable, and that the ingredients should be, so far as possible, free from this substance?

A. I, myself, made this observation, as I have previ- 578
ously testified to.

x-Q. 352. Have you obtained a patent or tried for a patent, or caused any publication to issue for this observation or discovery?

A. I have not, but I have put the observation in practice in the manufacture of wax.

x-Q. 353. What is the purpose of employing carnauba wax in the Aylsworth patent No. 782,375 and in the defendant's composition?

A. The purpose of adding the carnauba as men- 579
tioned in my patent, is to add certain properties as to shrinkage, and for toughening the composition.

x-Q. 354. In that Aylsworth patent and in formula 38, you employ both caustic soda and sal-soda. What is the purpose of employing both and why could not one only of these two be used?

A. The purpose of employing the caustic soda in addition to the sal-soda is to more readily dissolve the aluminum and retain the same in solution. If the
carbonate of soda alone were used, the solution would 580
dissolve the metal very much slower and would cause the separation of a large part of the aluminum in an insoluble form. So it is only necessary to add sufficient caustic soda to readily dissolve the metal and keep the same in solution. If all caustic soda is used, the result would be satisfactory, but being a caustic liquid, it is a little more disagreeable to handle, and also the caustic soda usually carries more impurities than the sal-soda.

x-Q. 355. In the first part of the cross-examination,

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you have made reference to immaterial changes or variations in the preparation of these compositions. What distinction do you make in this regard between immaterial changes and material changes in the preparation of composition for phonograph cylinders?

A. The immaterial changes referred to in answer to x-Q. 320, as I now recall, were changes in the percentages of ceresin or the softening ingredient and slight changes in the percentage of aluminum and soda, made 582 necessary by the varying demands of the record-taking department, and also by reason of the variation in the quality of the materials. These variations were always very slight. Upon referring to "Defendant's Exhibit, Comparative Statement," referred to in the same answer I find that I have omitted to include formula No. 1029, which was adopted as regular between the oleic acid formula No. 957 and the first regular stearate of alumina formula No. 1046.

x-Q. 356. Will you kindly write into Defendant's 583 Exhibit Comparative Statement, the figures of formula No. 1029 just referred to, basing the same upon the quantity of stearic acid in Macdonald formula A, namely 408 lbs.?

A. I will.

x-Q. 357. What difference if any is there between "aluminium" (or aluminum) and "alumina"?

A. Aluminium and aluminum, refer to the metal. Alumina generally in practice means the oxide of aluminum. However, alumina, if used in certain struc- 584 tures might refer generally to the metal, as for instance, if the statement were made that an alloy contained alumina, it would be understood to mean metallic aluminum. This would be incorrect, but such uses of the word alumina are frequently made, especially in reports of analyses.

x-Q. 358. That is, we would not speak correctly if we said "oxide of alumina," since the single term "alumina" would suffice?

A No, it would not be correct. The alumina always refers to the oxide in the same manner that strontia

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and magnesia would refer to the oxides of the metals strontium and magnesium.

x-Q. 359. Are you able to state from your knowledge in this art how the composition made in accordance with Complainant's Exhibit Defendant's Aylsworth patent 782,375, would compare in its physical properties—for sound record purposes—with the composition made in accordance with Macdonald's formula A ?

A. The composition under the Aylsworth patent was made for molding purposes ; that is to say—molding records and does not have to be cut. Although if prepared with the view of taking the records on it, it might be successfully used for that purpose, but on account of the lamp black there would be a little more scratch or foreign sounds given by a record made of this material than there would be on a composition similar to the Macdonald patent. On the other hand, the composition referred to in the Macdonald patent would not be suitable for molding a record, because of properties as to shrinkage and cast surface and hardness, and so on, which it possesses, and which are not suitable for making molded records.

x-Q. 360. That is, the composition of Macdonald formula A does not shrink enough, is not hard enough, for making molded records and will not give a cast surface ?

> Objected to as being immaterial and as having no basis in the direct examination. The present question and those immediately preceding it relating to a comparison between the compositions of the Aylsworth and Macdonald patents are obviously intended for the purpose of eliciting information for use in the suit pending in this circuit based on the Aylsworth patent in which complainant's selling agent, The Columbia Phonograph Company, General, is the defendant. Counsel for complainant is warned that by the series of questions he is now pursuing, he is

589 making the witness his own, and counsel for defendant now gives notice that the testimony will be so used by him in the said companion suit on the Aylsworth patent.

By Complainant's Counsel. Since defendant's counsel takes the question so much to heart x-Q. 359 is restated as follows:

x-Q. 361. Are you able to state from your knowledge
590 in this art, how the composition made by defendant, as stated in your direct examination as a witness for complainant, in its *prima facie* proofs would compare in its physical properties with the composition made in accordance with Macdonald formula A? Will you make the same answer you have made in connection with x-Q. 359.

Same objection and same notice.

Complainant's counsel declines, to accept the
591 witness as his own.

A. The differences between the composition of the Aylsworth patent as made by the defendant, and the composition referred to in the Macdonald patent, are as follows:

In making a molded record, it is necessary for the materials to solidify through a gradually reduced degree of plasticity to permit the shrinkage from the mold at sufficiently low temperature to insure the record
592 surface from damage and distortion. In this respect the composition mentioned in the Macdonald patent does not answer, whereas the composition mentioned in the Aylsworth patent answers perfectly. The property imparted to the composition which produces this result is derived from the carnauba wax and is due to the production in the method of making the wax of a reaction between the alcohols contained in the carnauba wax and the excess of stearic acid in the composition. Also, the record when made, should have the property

593 of wearing well under the reproducer needle. In this respect also, the two compositions differ, the composition as made under the Aylsworth patent wearing much better without a dimming or decrease in the sounds reproduced than does the one mentioned in the Macdonald patent. These properties are due to the toughening effect of the carnauba wax ingredient, and its combination produced by the reaction which takes place in making the wax. The two compositions differ also in the breakage, which results in a decreased per- 594 centage of records manufactured. The composition as made under the Macdonald patent, being more frail, there would be a very much larger percentage of broken records in handling in the various operations of manufacture, and also in use of the product. The two compositions vary also in the record surface, it being very difficult to produce a perfect surface with the Macdonald composition on account of the shrinkage of the records from the mold at too high a temperature, which produces a sort of a frosty appearance on the 595 record on the particular parts of the same which have left the mold first. The two compositions also vary in their tendency to warp after the record is cast; the records made by the Macdonald composition will warp more than those made in the composition where carnauba is used. The two compositions also vary in their color. In the composition mentioned under the Aylsworth patent, a black pigment is used for certain advantageous properties, which are mentioned in the patent; the Macdonald composition does not have 596 this black pigment.

x-Q. 562. Are you able to state from your knowledge in this art how the composition made by defendant would compare in its physical properties with the composition made in accordance with Macdonald formula B?

Same objection and same notice.
Same response by complainant's counsel.

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A. Since the properties of the composition as made by Macdonald formula A and Macdonald formula B are practically identical (the resulting compositions being practically identical) my answer to the preceding question and the comparison I there made would apply to the present question.

x-Q. 363. Are you able to state from your knowledge in this art how the composition made by defendant, when carnauba wax is omitted, would compare in its 598 physical properties with Macdonald formula A or Macdonald formula B?

A. With the carnauba omitted, the resulting compositions would be practically identical.

x-Q. 364. In the Comparative Statement in the formula for hydrate alumina, should not the symbols "H_2O" be enclosed in parenthesis so that coefficient 3 should apply to them both?

A. Where the coefficient precedes the symbol and is in large figures, it refers to all which follows in the 599 symbol unless the parenthesis is added. In this case it would be correct either way.

x-Q. 365. In this same formula, the aluminum is completely satisfied by the oxygen, is it not; that is, two atoms of aluminum, which is tri-valent, have combined with three atoms of oxygen, which is bi-valent, so that there is no equivalency remaining unsatisfied in either the aluminum or the oxygen?

A. The affinity of the aluminum for oxygen in this composition must be completely satisfied, as there are 600 no higher oxides of aluminum known. However, there may still be some slight affinity on the part of the aluminum for more oxygen or oxygen-like elements, but not enough to form a composition having one additional atom of oxygen. The resulting oxide of alumina is either basic or acidic in its properties, according to whether it is compared to a very strong acid or a very strong base.

x-Q. 366. In the same formula, is the affinity of the oxygen for aluminum also completely satisfied?

A. Yes.

601

x-Q. 367. In this same formula, what does the $3H_2O$ combine with ; what affinity does it satisfy ?

A. The H_2O combines with both the aluminum and the oxygen in their union as an oxide.

x-Q. 368. Can you write a graphic formula for hydrate of alumina ?

A. Do you mean by "graphic formula" a formula,
such as is used in organic chemistry to express the
bonds of affinity between the different elements or
group of elements, or do you mean a formula express- 602
ing the Al in its relation to the hydroxyl radical?

x-Q. 369. For the present, I mean the former.

A. In writing the formula in inorganic substances, it
is seldom that such graphic representation is used, as
it is not based on fact, but is only speculation, and
when used it is generally used by some ultra theoret-
ical professor. I have never had an occasion to write
the formula in that way, but, however, it is sometimes
written in a slightly different way, which means the
same as the way in which I have written it in the com- 603
parative statement, which would be $Al_2(OH)_6$. This
formula might be graphically represented on a plain
surface in a variety of ways, but those representations
would mean little to a practical chemist.

x-Q. 370. The formula you have just given is the one you refer to in the previous answer as expressing the Al in its relation to the hydroxyl radical?

A. Yes.

x-Q. 371. Please look at your formula in the
comparative statement for acetate of alumina. I 604
assume that, as before, the affinity of the
Ai_2 is completely satisfied by the O_3 and
vice versa. If this is correct, what do the
two radicals of water and the other two radicals com-
bine with ?

A. They combine with the more or less basic oxide of aluminum as a whole, not with either of the elements contained in the oxide of alumina alone.

x-Q. 372. What is the valence of the aluminum oxide as a whole ?

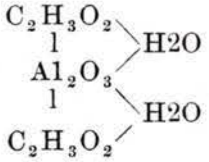
605

A. The valence of aluminum oxide as a whole cannot be expressed unless you specify what combination it is to be made with; for instance, in the case of stearate and acetate of alumina, the aluminum is bivalent, as it replaces two atoms of hydrogen. The particular formula expressing the acetate is taken from Watt's Chemical Dictionary and represents the basic acetate of alumina. This, however, is a very indefinite substance.

606 x-Q. 373. Can you write the graphic formula for acetate of alumina in either of the two methods indicated in your answer to x-Q. 368?

A. Yes, I can write the graphic formula, but before doing so, I would like to state that it may be that the formula given in the Comparative Statement for the acetate of alumina may be wrong as to the numeral after the oxygen included in the brackets. I got this formula from Watt's Chemical Dictionary, that is, the new and revised edition, and I may have made a mis-
607 take in copying it, or it may be an error in the formula as written in the book, or it may be right, I am unable just now to say. This, however, represents a very indefinite substance, and any graphical formula of this substance would probably be unsatisfactory and not conclusive. Assuming the oxygen to be O_2 included in the brackets, the formula might be written as follows:

608



$$\begin{matrix} C_2H_3O_2 & \\ | & \rangle H2O \\ Al_2O_3 & \\ | & \rangle H2O \\ C_2H_3O_2 & \end{matrix}$$

This represents one graphical way of writing the formula as given, but it is my own way off-hand and might not coincide with the way it may be written in books. However, there is nothing sure about the linking of the elements in such compounds together, and I should consider that as long as the total number of atoms of each substance are given in the formula, one would be as near the actual truth as the other.

609

x-Q. 374. Please refer to the formula in your Comparative Statement for Stearate of alumina, in which the radical has been given as an average to represent the presence of equal quantities of stearate and palmitate. Is the affinity of the aluminum completely satisfied by the two radicals, and *visa versa*, is the affinity of this two-fold radical completely satisfied by the alumina?

A. I would consider that the affinity in this case represents the nearest to a balance between the two substances; that is--the aluminum and the acid radicals. 610 In this case, the aluminum is united to a mono-valent acid and the aluminum being tri-valent, I should say offhand that that would explain the fact that resulting compounds would appear as if the aluminum was bi-valent.

x-Q. 375. Accepting your suggestion that the formula $C_{17}H_{33}O_2$ is a fair expression for the mixture of stearate and palmitate, would the formula $Al_2(C_{17}H_{33}O_2)3$, indicate that in that formula the Al is trivalent? 611

A. No, in order for the formula to appear as you have written it tri-valent, using Al_2 it would be necessary to put "6" after the bracket instead of—3, as you have it.

x-Q. 376. Please state briefly what the figures in the line opposite the symbol Na_2O represent?

A. They represent the total alkali reduced down to terms of sodium oxide, which in analyses, it is usual to express the soda found.

x-Q. 377. I will amend my x-Q. 375, and ask if the 612 formula $Al(C_{17}H_{33}O_2)3$ would indicate that, in that formula, the aluminum is tri-valent?

A. Yes.

Re-direct Examination by Mr. Dyer.:

Re-d. Q. 378. Having reference to formula No. 1029 kindly place on the record, a comparative statement based on 408 lbs. of stearic acid, showing the relation

613 between the same and the formula A of the Macdonald patent in suit?

A.

614

Formula A. Macdonald		Formula No. 1029 in terms of Comparative Statement.
408 lbs.	Stearic acid	408 lbs.
27.2 "	Caustic soda	32.7 "
15.3 "	Aluminum Hydrate (expressed in terms of acetate of alumina)	11.6 "
72 "	Ceresin	138 "

Note: Amount of stearate of alumina formed

Macdonald .... 48.4 lbs.
No. 1029 .... 37.5 "

Percentage of saponified stearic acid

615 Macdonald 44.9%
No. 1029 .... 54 %

Re-d. Q. 379. Can you ascertain from your note books when this formula No. 1029 was regularly adopted as regular?

A. The composition of this formula was accepted by Mr. Edison as regular and as such, wax was manufactured under this formula by the Edison Phonograph Works for a considerable period. This formula was used during the time of my experiments with stearate
616 of alumina and until No. 1046 was adopted. This was sometime prior to August 1889, since the date August 14th, 1889 appears in my note book in connection with experiment No. 1055.

Re-cross-examination by Mr. Massie:

Re-x-Q. 380. Why was No. 1046 substituted for No. 1029?

A. As explained in note book No. 565 opposite to experiment No. 1046, this formula was developed with

617 the object of cheapening or replacing the more expensive acetate of aluminum.

Re-x-Q. 381. Have you applied for or obtained a patent or formula No. 1029?

A. No.

Re-x-Q. 382. Why not?

A. Because at the time that these formula were being developed it was Mr. Edison's desire to keep them a trade secret.

Re-x-Q. 383. Did your analyses reported in "Defendant's Exhibit, Statement of Aylsworth Analyses" show in what form the soda had been employed, whether as sal-soda or caustic soda, etc.? 618

A. No, it would be impossible to tell from the analysis what form of soda had been used.

Signature and certificate waived.

Adjourned subject to notice.

619

Frank A. Storms.

Frank A. Storms, a witness produced on behalf of defendant, having been first duly sworn, testifies as follows, in answer to questions proposed by Mr. Dyer.

Direct Examination by Mr. Dyer.

Q. 1. Please give your name, age, residence and occupation? 620

A. Frank A. Storms, age—35 years, residence—Keystone Hotel of Ward Street, Newark, N. J., occupation—painter by trade.

Q. 2. Were you ever employed by the Edison Phonograph Works:

A. Yes.

Q. 3. When was this?

A. I came to work here in 1889 (November), and was in and out a number of times and left the wax room at the time Mr. Stone was foreman.

621

Q. 4. Do you remember when you were employed in the wax room?

A. Off and on between 1889 and I think some time in 1892.

Q. 5. Did you ever work in the wax room again.

A. Yes, I worked under Mr. Dodd.

Q. 6. When was this?

A. About three years ago.

Q. 7. What were your duties when you were first em-
622 ployed in the wax room.

A. I took charge of the machines for turning, edging and reaming the blanks.

Q. 8. Where you were employed in August 1896?

A. I was employed here when Mr. Aschenger was here.

Q. 9. In what capacity?

A. I had charge of the wax room, and he had charge of the mixing. I was foreman of the molding department.

623 Q. 10. How long had you been employed in the molding department at this time?

A. I was there several months.

Q. 11. Did you ever ascertain the formula of the wax composition that was used by the Edison Phonograph Works, or that you were informed, was used by the Edison Phonograph Works in or prior to August, 1895?

A. No.

Q. 12. Did you ever know a man named Higgins,
624 who was at one time connected with the Edison Phonograph Works?

A. He was not connected with the Edison Phonograph Works, he was connected with the Edison Manufacturing Company.

Q. 13. Did Higgins ever give you what he said was the formula of the wax composition used by the Edison Phonograph Works?

A. Yes.

Q. 14. When was this?

A. The latter part of August, 1896.

625

Q. 15. How did Mr. Higgins happen to give you this formula?

A. By my asking for it, that was all.

Q. 16. Before Higgins gave you the formula, did you know anything about the ingredients that were used in the composition?

A. I did, I knew every ingredient, but not the proportions.

Q. 17. Can you now explain what was the formula as you knew it in August, 1896, as you obtained it from 626 your own knowledge and from what Higgins told you?

A. 100 lbs. of stearic acid, 22½ lbs. of sal soda, 458 grams of caustic soda, 175 grams of aluminum bronze powder, four gallons of water, 18 lbs. of ceresin. Temperature 360 for stearic for adding the solution. 420 degrees the highest temperature to be used.

Q. 18. In August 1896, did you know how to make the wax composition, and if so, please describe it?

A. I saw the water, sal-soda, caustic soda and the 627 aluminum—that is the solution.

Q. 19. How was this solution made?

A. They had a steam-pipe running into the iron kettle; this steam pipe would heat the water, then the sal-soda was added, thoroughly dissolved, then the caustic soda was added, thoroughly dissolved, and then the aluminum powder was added gradually.

Q. 20. Did you ever see the solution made?

A. Yes, I saw Mr. Aschenger make it.

Q. 21. When this solution was made what was done 628 with it?

A. It was added to the stearic acid.

Q. 22. Was the stearic acid cold?

A. It was up to 360 degrees.

Q. 23. Was this temperature hot enough to melt it?

A. The melting point is about 180 degrees. The temperature had to be high enough to drive the water out of the solution.

Q. 24. Having heated the stearic acid to 360 de-

629 grees, or about 80 degrees above the melting point, what was then done ?

A. The solution was then added gradually.

Q. 25. Did you see Mr. Aschenger do this ?

A, Yes, I used to go back and forth right along, only a never saw him weigh the stuff.

Q. 26. Why was the solution added gradually to the melted stearic acid ?

A. Well, if you put it all in at once, it would congeal
630 so that when she did start to drive the water out, it would foam all over.

Q. 27. After all the solution had been added slowly to the melted stearic acid, what was then done ?

A. Ceresin was added.

Q. 28. During all this time, was the composition maintained in a heated state ?

A. It was run up, as I said, to 420 degrees to drive all the impurities out.

Q. 29. Where did Mr. Aschenger make the wax com-
631 position ?

A. Down in the old wax building, No. 10, I think.

Q. 30. And where was your room ?

A. Just adjoining.

Q. 31. Were you free to go in and out of Mr. Aschenger's room ?

A. I had to go in and out that way to go to the boiler room ; I had charge of the boiler room.

Q. 32. As I understand it, in passing back and forth through Mr. Aschenger's room, you had the opportun-
632 ity of seeing the several operations performed in making the composition ?

A. That is right.

Q. 33. For how long a time did you have this opportunity ?

A. For several weeks, about six weeks. The plant was formerly at Silver Lake, and was here at Orange only about six weeks before I got out.

Q. 34. After the proportion of the ingredients was given you Mr. Higgins, what was then done ?

A. I wrote to Mr. Macdonald for a position, stating

633 that I had the Edison formula. In reply Mr. Lippi told me come on and see Mr. Macdonald. He goes by the name of Vonderlippi.

Q. 35. Who was Mr. Vonderlippi, or Mr. Lippi?

A. He had charge of the Sapphire Department, and was formerly connected with the Edison people.

Q. 36. Was he a friend of yours?

A. A personal friend; we had known each other for years—working together here in the factory.

Q. 37. How was it that Mr. Vonderlippi or Mr. 634
Lippi happened to write to you and ask you to come up to Bridgeport?

A. I wrote Mr. Lippi and ask him if there was any chance and in reply he told me to come up to see Mr. Macdonald.

Q. 38. Then, as I understand it, you did not write to Mr. Macdonald, as you have stated in answer to Q. 34?

A. No, I had a personal interview with Mr. Macdonald and he told me if I had the formula to come up 635
and he would employ me.

Q. 39. Do you remember when you saw Mr. Macdonald?

A. I left here on Labor Day, but had been up there a week previous when I first saw him.

Q. 40. That is to say—you went up to Bridgeport to go to work, leaving here on Labor Day to go to work the following day, but you saw Mr. Macdonald a week previous. Is that correct?

A. Yes. 636

Q. 41. Who is Mr. Macdonald?

A. At that time he was practically manager of the Graphophone Company.

Q. 42. When you first saw Mr. Macdonald, what did you say to him?

A. I simply asked him if he wanted to adopt the Edison mixture. He said, yes, he would give it a try. At the same time, they were using the Edison blanks for masters.

637

Q. 43. What do you mean by " they were using the Edison blanks for masters " ?

A. Duplicating from them.

Q. 44. Was the Graphophone Company at that time making blanks itself ?

A. Yes.

Q. 45. When you saw Mr. Macdonald the first time did you tell him any of the ingredients that the Edison composition had ?

638 A. I asked him if they used sal-soda in their mixture and they said—no, and I told him to get the aluminum and that I would be up the following week.

Q. 46. Where did you tell him to get the aluminum powder ?

A. The Pittsburgh Reduction Company.

Q. 47. Did you ask him to get anything else beside the aluminum powder ?

A. Sal-soda, also, ceresin—they were using paraffine.

639 Q. 48. When you went up to Bridgeport the day after Labor Day, 1896, did Mr. Macdonald have the aluminum powder, the sal-soda and the ceresin ready for you ?

A. All the ingredients were ready. Also, a little private room was fixed up, ready for use.

Q. 49. Did you attempt to reproduce the Edison formula, as given you by Mr. Higgins, at the factory of the American Graphophone Company.

A. I did.

640 Q. 50. When was this ?

A. This was September the 10th, I made the first mixture, 1896.

Q. 51. By the process as you saw it carried out by Mr. Aschenger ?

A. It was.

Q. 52. How much of the composition did you make on September 10th, 1896 ?

A. 25 or 50 lbs.

Q. 53. Did you show the result to Mr. Macdonald ?

A. Mr. Macdonald was very much interested, and

641

after I started to make the mixture, he could not seem to wait long enough for it to cool off, and I think it was one barrel of blanks we sent to Washington.

Q. 54. What were these blanks made of that you now refer to?

A. They were made of this mixture.

Q. 54. Were they made of the first mixture that you made on September 10th?

A. They were.

Q. 55. Did Mr. Macdonald tell you that these blanks were sent to Washington? 642

A. He did.

Q. 56. Did he tell why they were sent to Washington?

A. That is the head office of the Columbia Phonograph Company, or of the Graphophone Company, to have Mr. Easton decide whether they would adopt that mixture?

Q. 57. Did Mr. Macdonald state the result of the decision of Mr. Easton? 643

A. He came to me and said that Mr. Easton had decided to adopt the mixture—not with a very pleasant face either.

Q. 58. After this decision to adopt the Edison composition, what did you then do?

A. I went ahead and made the mixture.

Q. 59. Did you still use the process as you saw it practiced by Mr. Aschenger, and the formula as given you by Mr. Higgins?

A. Yes. 644

Q. 60. How long did you continue to make the Edison composition for the Graphophone Company?

A. About two years.

Q. 61. When you started actual work at Bridgeport, did you disclose the formula to Mr. Macdonald?

A. Not any more than the ingredients—not the proportions.

Q. 62. Did Mr. Macdonald ask you to disclose to him the proportions of the ingredients?

645 A. He did not, but did a lot of experimental work on his own part, trying to find the proportions.

Q. 63. At any time during your connection with the Graphophone Company, did Mr. Macdonald ask you to give him the formula, showing the proportions of ingredients ?

A. He did in April 1897 and I gave it to him at that time.

Q. 64. State the circumstances under which you gave
646 the formula to Mr. Macdonald ?

A. I wasn't feeling very well at the time and Mr. Funnell and Mr. Farina were there making a mixture of their own, and I was conducting the Edison mixture, and I asked Mr. Macdonald for a couple of weeks vacation. My brother-in-law was working there with me, his name is O'Connor. I told Mr. Macdonald that my brother-in-law was capable of making the mixture and he said he would give me the two weeks off, providing I show Mr. Funnell the formula. On those con-
647 ditions I asked him how long my position would last; he said, as long as he was connected with the Graphophone Company. Mr. Macdonald promising to give me steady work, I gave Mr. Funnell the formula, After I came back from my vacation I still continued on until about the latter part of July, or the first of August, 1897, and then I was laid off and Mr. Funnell was retained. I was only supposed to be laid off temporarily and was away about one month. Then I returned and worked until November and was then laid
648 off permanently.

Q. 65. Do I understand from your last answer that you were connected with the Graphophone Company from September 1896 to November 1897 ?

A. It should be November 1898, I was mistaken in saying 1897.

Q. 66. Was it in April 1897 or April 1898 that you gave the formula to Mr. Funnell ?

A. 1898.

Q. 67. How do you fix this date of November 1898 ?

A. By reason of the fact that in December 1898 my

649

boy was seriously burned the day after Christmas and died.

Q. 68. You have already said that when you went up to Bridgeport the Graphophone Company was using Edison blanks as masters, on which they were duplicating on their own blanks. Do you know who was making the composition for the Graphophone blanks ?

A. Mr. Fargo.

Q. 69. Did Mr. Fargo tell you what composition he was using ? 650

A. He did not.

Q. 70. Did Mr. Macdonald tell you what composition Mr. Fargo was using ?

A. The only thing he said that they didn't use the aluminum bronze metal, but did use the hydrate of alumina.

Q. 71. Were the blanks which Mr. Fargo was making as good as the Edison blanks ?

A. They couldn't have been or Mr. Easton would not have decided to adopt the Edison composition. 651

Q. 72. What was the objection to the Graphophone blanks ?

A. Very brittle.

Q. 73. Was there any other trouble.

A. Any more than crystallization—they were bothered quite some with that.

Q. 74. Was there any rivalry between you and Mr. Fargo ?

A. Any more than a little jealousy on his part.

Q. 75. How do you know that Mr. Fargo was a little 652
jealous of you ?

A. When they decided to adopt my mixture, Mr. Fargo went to Mr. Macdonald and told him that either him or I would have to get out.

Q. 76. Did Mr. Macdonald tell you this ?

A. Yes, and Mr. Fargo left of his own accord.

Q. 77. How long was Mr. Fargo with the Graphophone Company after you went there ?

A. I should judge about two or three weeks—would not be positive.

653 Q. 78. After Mr. Fargo left and as long as you were connected with the Graphophone Company, did they still continue to make the Edison composition? In other words—did you, yourself, make all the wax for them, or did they continue to use the hydrate of alumina process that Mr. Fargo was working on?

A. There was no mixture made there while I was there with the exception of the Edison mixture.

Q. 79. Did you make the Edison mixture or composition for the Graphophone Company in large quantities? 654

A. Between 1000 or 1200 lbs. a day.

Adjourned until Thursday, December 28th, 1905, at 10:15 A. M.

JAN. 9th, 1906.

Met pursuant to adjournment.

655 Present: PHILIP MAURO, ESQ, for Complainant, FRANK L. DYER, ESQ. for Defendant.

The witness, FRANK A. STORMS, is produced for cross-examination.

CROSS-EXAMINATION BY MR. MAURO:

x-Q. 80. Where are your working now?

656 A. Not employed at present.

x-Q. 81. How long have you been out of employment?

A. About two months.

x-Q. 82. What was your last job?

A. Painting.

x-Q. 83. And where?

A. East Orange.

x-Q. 84. How did you come to leave your last job?

A. Disagreement with my brother.

x-Q. 85. Were you working for your brother?

657 A. I was working for Wm. H. Canfield, but my brother was foreman.

x-Q. 86. Did the disagreement grow out of your habits ?

A. Partly.

x-Q. 87. Were you in a condition to do good work, and are you now in a condition to do good work ?

A. I think so.

x-Q. 88. Have you a wife ?

A. I have. 658

x-Q. 89. Do you support her ?

A. Not at present.

x-Q. 90. Who has been taking care of you during the last week or ten days ?

A. Well, I don't know anyone in particular.

x-Q. 91. You have had money from some one, from whom did you get it?

A. Well, I had a few little trinkets, which I got rid of.

x-Q. 92. Do you swear that you have lived for the 659 last week on a few little trinkets that you got rid of ?

A. Yes, it doesn't take much to keep a man, when he is idle.

x-Q. 93. Have you received no money from any one connected with this case ?

A. Not directly, no.

x-Q. 94. But indirectly you have ?

A. Well, Mr. McCoy has paid for my room.

x-Q. 95. Who is Mr. McCoy ?

A. He is a private detective, I believe, as far as I 660 know.

x-Q. 96. Mr. McCoy has been looking after you very closely of late, hasn't he ?

A. I have seen him two or three times a week.

x-Q. 97. Does he follow you around in saloons, into dives, and such places ?

A. He does not, he has no occasion to.

x-Q. 98. How long has it been since your habits has prevented you from keeping a steady job ?

661 A. They never have prevented me from keeping a job, when I had it.

x-Q. 99. In one of your answers you gave a formula for a wax composition, can you repeat that formula now?

A. I can.

x-Q. 100. Please do so?

A. 100 lbs. of stearic acid, 22½ lbs. of salsoda, 458 grams caustic soda, 175 grams of aluminum bronze
662 powder, four gallons of water, 18 lbs. of ceresin.

x-Q. 101. When you gave that formula the other day you read it from a note book, have you that note book with you?

A. I have.

x-Q. 102. Please let me see it?

A. Is it necessary?

x-Q. 103. How long have you had this note book?

A. Quite a few years.

x-Q. 104. How many years?

663 A. I could not say exactly, I have had numerous note books, and have made copies from time to time.

x-Q. 105. When did you write this memorandum in it?

A. I should judge about two months ago.

x-Q. 106. In the condition in which this book now is, it contains four leaves and no more, and the formula which you gave is written on the last leaf, there being nothing else on any of the other leaves, is that correct?

664 A. It is.

x-Q. 107. I am informed that you were discharged from the service of the Graphophone Company on account of continual and habitual intoxication. What have you to say about that?

A. I did not get discharged, but was laid off temporarily,—slackness of work Mr. McDonald told me.

x-Q. 108. I am informed that after you were discharged for the reason stated, you came back after about two weeks and was taken on again on your promise to let

665 liquor alone, but that you did not keep this promise and was very shortly thereafter discharged finally. What have you to say about that ?

A. Nothing.

x-Q. 109. I am informed that the period of two weeks' absence referred to in your answer 64, as a vacation, was the period during which you were dismissed for intoxication. What have you to say about that ?

A. It was no such thing.

x-Q. 110. Did you ever claim to Mr. Macdonald that 666 the formula you described to him was the Edison formula ?

A. I did.

x-Q. 111. I am informed that you did not, do you say that my information is untrue ?

A. I do.

x-Q. 112. Do you swear to it ?

A. I will.

x-Q. 113. Have you been drinking this morning ?

A. I have not. 667

x-Q. 114. Will you swear to that ?

A. I will.

x-Q. 115. Mr. Storms, you smell very strongly of liquor, do you swear that you have not been drinking this morning ?

A. If you call one drink, drinking, why I don't. I have a voucher for that, Mr. McCoy can prove that.

x-Q. 116. You state that you have had one drink this morning, but that you don't call that drinking ?

A. I do, but not drinking to excess. 668

Signature and certificate waived.

669

Francis R. Upton.

Francis R. Upton, a witness produced on behalf of defendant, having been first duly sworn, testifies in answer to questions proposed by Mr. Dyer, as follows:

Direct Examination by Mr. Dyer:

670 Q. 1. Give your name, age, residence and occupation?

A. Name—Francis R. Upton, residence—59 High Street, Orange, N. J., age—53, occupation—dealer in mason's materials.

Q. 2. Did you ever own a phonograph?

A. I did.

Q. 3. When?

A. About the years 1892 and 1893, and prior to that.

Q. 4. I show you what purports to be a phonograph
671 record, and ask if you can identify the same?

A. I identify it as one of which the record was made at my house.

Q. 5. When was this record made?

A. On January 1st, 1893.

Q. 6. How do you fix this date?

A. I have just listened to this record on the phonograph and the record was without question made at this time. The date appears on the record.

Q. 7. Aside from this date, would you be able to fix
672 the time when the record was made?

A. I would be.

Q. 8. How?

A. From the fact that the people who are mentioned on the record were never together, except at this time.

Q. 9. In whose voices was this record made?

A. The first part of the record sounds like my voice, and is a record of my voice I believe. The latter part of the record is made with several voices. The voices of the children I do not recollect, as they are now grown men and women. The voice of my brother's

673
wife I recognize, and I also recognize the voice of my brother.

Q. 10. Was your brother and his wife at your house on January 1st, 1893?

A. They were.

Q. 11. Under what circumstances?

A. My brother had married for the second time shortly before this and I invited him with his children to visit me during the Christmas holidays.

Q. 12. Has this record been in your possession since 674
the time it was made?

A. It was in my possession until I sent it to Mr. Wangemann.

Q. 13. When did you send it to Mr. Wangemann?

A. My recollection is—last Spring.

Q. 14. Of 1895?

A. Yes.

> The record referred to by the witness is
> offered in evidence and marked "Defendant's 675
> Exhibit, Upton Record".

Q. 15. Can you produce any other records owned by you at an early date?

A. At the same time I sent Mr. Wangemann all the records that I owned. The dozen records in the box before me look like the records which were sent to Mr. Wangemann.

Q. 16. Assuming that the dozen records which you
are now examining are the ones which you sent Mr. 676
Wangemann in the Spring of this year, when did you
obtain them?

A. I obtained all my records prior to or during the year 1892.

Q. 17. Have you any reason to doubt that the dozen records before you are some of the records which you turned over to Mr. Wangemann in the Spring of this year.

A. I have none.

Q. 18. Assuming that these records are among those

677 turned over to M. Wangemann, were they kept in your possession continuously from the time you obtained them, during or prior to the year 1893?

A. They were.

The dozen records referred to are offered in evidence and marked "Defendant's Exhibit, Erminy Record", "Defendant's Exhibit, Parlor Orchestra Record", "Defendant's Exhibit, 678 Gypsy Song Record", "Defendant's Exhibit, Twenty-third Regiment Band Record", "Defendant's Exhibit, Hungarian Band Record," "Defendant's Exhibit, Cornet Solo Record", "Defendant's Exhibit, Farenell Record", "Defendant's Exhibit, Chapel Record", "Defendant's Exhibit, Violin Record", "Defendant's Exhibit, P O Record", "Defendant's Exhibit, Quartette Record", and "Defendants Exhibit, Sea Breeze Record".

679 Direct examination closed.

By Mr. Massie: The deposition of this witness is objected to as irrelevant and immaterial, and complainant's counsel declines to cross-examine.

Signature and certificate waived.

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681

Orange, New Jersey, December 28, 1905.

Met pursuant to adjournment.

Present: Counsel as before.

Walter H. Miller.

Walter H. Miller, a witness produced on behalf of defendant, having been first duly sworn, testified in answer to questions proposed by Mr. Dyer as follows: 682

Direct Examination by Mr. Dyer:

Q. 1. Give your name, age, residence and occupation?

A. Walter H. Miller, 36 years of age, 10 Baldwin Terrace, Orange, N. J., occupation—Manager of the Record Department of the National Phonograph Company. 683

Q. 2. How long have you been employed by the National Phonograph Company?

A. About 8 years.

Q. 3. Were you ever employed by Mr. Edison?

A. Yes sir.

Q. When did you enter Mr. Edison's employ?

A. I started in the Spring of 1887 and continued until 1893.

Q. 5. When you entered Mr. Edison's employ, what were your duties? 684

A. I first started as a mechanic in the shop and then took hold of the phonograph as an experimenter.

Q. 6. Are you acquainted with Mr. J. W. Aylsworth, and if so, how long have you known him?

A. I have known him since 1887.

Q. 7. How long were you employed in the Machine Shop before you began experimental work in the Laboratory?

A. About six months.

Q. 8. Did you ever have any connection with the

685 manufacture of wax compositions for phonograph blanks?

A. Yes sir.

Q. 9. When and where was this?

A. I started sometime during 1891 at Silver Lake.

Q. 10. Was there a plant at Silver Lake?

A. Yes sir.

Q. 11. How did you happen to start in on this work at Silver Lake?

686 A. Mr. Aylsworth having had charge of the work at that time, was about to leave this position to take charge of the filament plant of the Edison Lamp Works at Marion, and I was given his position to make wax.

Q. 12. Mr. Aylsworth, then, as I understand you, had been making wax at Silver Lake before you went there?

A. Yes, sir.

Q. 12. Do you know whether Mr. Aylsworth had

687 made any experiments on wax compositions before he went to Silver Lake?

A. I know he was engaged at the Laboratory for several years experimenting on the wax.

Q. 14. Do you know whether the wax was ever made by the Edison Phonograph Works at Orange prior to the Silver Lake plant?

A. Not that I know of.

Q. 15. When you took charge of the work at Silver Lake how was the process and formula for the wax

688 composition explained to you?

A. Formulas were given to me by Mr. Aylsworth and he showed me the details of wax manufacture by making a batch of wax for me.

Q. 16. In what form did Mr. Aylsworth give you the formula for the wax composition?

A. On letter heads of J. W. Aylsworth, 48 Germania Avenue, Marion, New Jersey.

Q. 17. Did you ever keep a note book, giving the wax formulas and the process of making the same?

A. I did.

689 Q. 18. Can you produce this note book?

A. I can and do.

Counsel for defendant offers the note book in evidence and the same is marked "Defendant's Exhibit, Miller Notebook."

Q. 19. When did you enter the notes in this note book?

A. Within a few days of the time Mr. Aylsworth handed me his written formulas. 690

Q. 20. Do I understand that the notes in this note book were copied from the data furnished you by Mr. Aylsworth?

A. Yes, sir

Q. 21. Why did you copy this information in the note book?

A. So that I could preserve it better and carry it in a more portable form; at the same time, I preferred a duplicate copy. 691

Q. 22. Are you a chemist?

A. No, sir.

Q. 23. Kindly place on the record the note beginning on page 2 of this note book entitled "The Making of Stearate of Aluminum" and explain the same?

A. The note is as follows:—

"THE MAKING OF STEARATE OF ALUMINUM."

Dissolve in tank on roof, so as to make a saturated solution of alum with water, after which filter in tank below. Then fill jacketed kettle with stearic acid, after melting add solution of caustic soda, stir up well, then shovel in tank No. 2 on platform. Add tank half full of water, boil same until dissolved. Then fill tank No. 3 on floor with one foot deep of this solution and let filtered alum solution run in until a peculiar crumbly condition; the solution (stearic acid and caustic soda) to be very hot when alum 692

693 is run in, it is then run in trough No. 4 and strained and washed four times by turning hose on and stirring, then allow water to drain off thoroughly and put in press and squeezed, then put in pans to dry in oven for two days or more, the longer the better."

This note appears on pages 2 and 4 of the note book. On page 3 is another note, relating to the same thing,
694 as follows :

"MAKING OF POWDER.

> Take 200 lbs. of stearic acid, melt and with constant stirring add 65,232 C. C. of caustic soda solution of 1200 gravity at 70 degrees F. (3700 C. C. to a gallon of water) 18. This will make about 200 lbs. of powder as the amount gained by the reaction is lost in washing and working.
> 695 65,232 CC. equals 17 gal. plus 2332 CC."

Powder was always the term used by the employees who assisted in making stearate of alumina. This formula and method relates to the method and manner of making the stearate of alumina which was used by me in making wax for phonograph cylinders.

Q. 24. In making the stearate of alumina, as described in your note book, what was the effect when the caustic soda solution was added to the melted
696 stearic acid in the jacketed kettle?

A. The stearic acid was melted and to this was added caustic soda of 1200 gravity, and the results obtained was a mixture of a consistency of soft soap.

Q. 25. Was this soap-like mass capable of being shovelled from the jacketed kettle into tank No. 2 referred to?

A. It was, and that was the method we used in putting it into tank No. 2.

Q. 26. What relation does the note on page 3 of

697 your note book have to the note commencing on page 2 ?

A. On page 3 I describe how the mixture of stearic acid and caustic soda were proportioned and mixed, and on page 2 I describe how the saturated solution of alum was made and how it was mixed with the stearic acid and soda.

Q. 27. What was the appearance of the stearic of alumina as produced by the process which you have described ? 698

A. It was white powder. Before it was in the dry condition, it resembled pot-cheese to a certain extent and after it was thoroughly dried, it was somewhat similar to flour.

Q. 28. Please refer to your note on page 6, quote the same on the record and if necessary, explain it ?

A.

"THE MANUFACTURE OF WAX. 699

> Melt Stearic Acid with slow or slight heat and filter through bags of fine filter cloth, then heat to 350 degrees F., then add pure carbonate of Soda Crystal little by little, at the same time raise the temperature, after this mixture is thoroughly foamed off, add powder, after this is foamed off strain through 4 or 5 thicknesses of fine muslin, add ceresin."

Q. 29. What is the asterisk before the word "add" 700 in this note indicate ?

A. It indicates that after the powder was added, and foamed off, the ceresin was next added, and then strained through 4 or 5 thicknesses of fine muslin.

Q. 30. Does this note book indicate the percentage of ingredients used by you in the manufacture of wax compositions at Silver Lake ?

A. It does.

Q. 31. Please quote the formula in question ?

A. The formula which was mostly used is on page

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701 12, and is called "12 per cent wax" and contains the following proportions:

400 lbs. of stearic acid
116-¼ lbs. of carbonate of soda
68 lbs. of stearate of alumina
65 lbs. of ceresin.

702 This was called 12 per cent wax for the reason that when it was finished it contained 12 per cent of ceresin. We also used several other formulas, with the only change that the ceresin varied and was named from the percentage of ceresin it contained.

Q. 32. Where reference is made in the several formula on page 12 of your note book to "soda", does this have reference to the "pure carbonate of soda crystals" referred to on page 6?

A. It does.

703 Q. 33. And as I understand you, the "powder" referred to is the stearate of alumina made by the process contained on pages 2 and 4 of the book?

A. It is the same thing, and is fully described on pages 2, 3 and 4.

Q. 34. Do I understand that you made at Silver Lake two kinds of wax compositions, one containing 12 per cent. of ceresin, and the other 5 per cent. of ceresin?

A. Yes, sir.

704 Q. 35. What was the purpose of making two grades of composition?

A. To make a harder or softer wax, the 12 per cent. ceresin wax being considerably softer than the 5 per cent.

Q. 36. What was the 12 per cent. wax used for?

A. For the phonograph trade in general.

Q. 37. What was the 5 per cent. used for?

A. Some was used for the phonograph trade, but mostly for recording master records.

Q. 38. Is it important that master records should be hard?

705

A. Not absolutely necessary, but it was our opinion at that time that 5 per cent. wax was somewhat smoother.

Q. 39. Who, if you know, was the principal user of the 5 per cent. composition?

A. As near as I can recollect, Mr. Edison and the Edison Phonograph Works.

Q. 40. When you say that the 12 per cent. wax was used by the phonograph grade in general, what does that mean? 706

A. That this wax was molded and delivered to the North American Phonograph Company, who used it in their business for dictation and musical records. Also, sold to other firms who recorded musical records.

Q. 41. Can you tell me approximately the relative amounts of the 12 per cent. composition and the 5 per cent composition manufactured by you at Silver Lake?

A. I cannot recollect the amount of 5 per cent. wax manufactured, but I do not think it exceeded 20 per 707 cent. of our output.

Q. 42. On page 8 of your note book, I find certain "Pointers", which I will ask you to quote on the record, and explain, if necessary?

A.

POINTERS.

The smallest that can be made in one kettle is 400 lbs. of stearic acid or it will blacken at 708 at the sides if less.

600 lbs. is the most of stearic can be made at a time or soda will foam over.

To make wax raise stearic to 300°F. Add $NaCO_3$ (soda) little by little until nearly $\frac{4}{5}$ is in, then raise heat to 350°F. and work in more, then to 380°F. and work in remainder, after it is foamed off add powder, raise to 430°F. and keep there until foaming ceases, then add ceresin after this is well dissolved, after

709 which filter at 450°F through 5 thicknesses of muslin.

Stearic acid to be used is Mitchell's filtered.

Soda the regular commercial.

Q. 43. I observe on page 10 of this note book, after the "Pointers", which you have just quoted on the record the words in lead pencil "or Procter & Gamble". Do you remember when these latter
710 words were added to the notes and what do they refer to?

A. I cannot recollect why this was put down, unless it referred to a particular make of stearic acid, which we might have used.

Q. 44. Are these words in lead pencil in your handwriting?

A. They are.

Q. 45. What is meant by the statement that if less than 400 lbs. of stearic acid is used "it will blacken at
711 the sides"?

A. The kettles which we used to manufacture wax in were about five feet in diameter, the shape of a half sphere and it was so arranged that the heat from the furnaces surrounded the outside of the kettles within a few inches of the top, and if an insufficient amount of material was placed in it, it would carbonize, due to the excessive heat.

Q. 46. Please explain the note on page 14 of your note book?

712 A. This relates to a description of a method of analyzing a material which contains stearic acid and ceresin. In the manufacture of molded blanks there always accumulated a lot of wax sweepings and shavings, which we did not think it advisable to melt up and filter and mix with new wax, so that we took this material and put it through a recovering process, the result of which we obtained a material which contained stearic acid with a certain percentage of ceresin. On page 14 the method is explained which

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I used to find out the proportions of stearic acid and ceresin.

Q. 47. What does the note on page 16 relate to?

A. A part of this recovering process which I have just spoken of.

Q. 48. As I understand the recovery process, described on page 16, you boiled 500 lbs. of wax, added 55 lbs. of sulphuric acid and skimmed off the mass floating on the top?

A. Yes, this is correct. This material was tipped off 714
and poured into pans and was a very black looking mass. After it was fairly dried out, it was put in a distilling apparatus, the product of which was stearic acid and ceresin.

Q. 49. Was this recovered stearic acid and ceresin used commercially?

A. It was. When we made up a new batch of wax, we always added a certain amount of this distilled material, mixed with new stearic acid.

Q. 50. Can you tell me what the figures on page 19 715
refer to?

A. As near as I can recollect, they refer to my figures computing the expense in recovering stearic acid and ceresin from scrap wax.

Q. 51. A few pages from the end of this note book I find a note under the heading " Problem " and will ask you to explain the same?

A. There had accumulated at the wax plant several
tons of wax, which contained different percentages of
ceresin, and in order to mix this wax with new wax, it 716
was necessary to compute the amount of this old wax,
which had various amounts of ceresin in it, which
should be added to give the desired percentage of
ceresin. It was thought best not to make molded
blanks out of this old wax; we thought better results
could be obtained if mixed with new.

Q. 52. Can you produce some of the original notes on loose sheets, which Mr. Aylsworth gave you when you took charge of the Silver Lake plant?

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A. I produce three of these sheets in Mr. Aylsworth's own hand-writing.

> The three sheets referred to by the witness are offered in evidence and marked "Defendant's Exhibit, Aylsworth-Miller Note No. 1," "Defendant's Exhibit, Aylsworth-Miller Note No. 2," and "Defendant's Exhibit, Aylsworth-Miller Note No. 3."

718

Q. 53. The Note on Exhibit No. 3, above referred to, as I understand it, was copied by you on page 3 of your note book?

A. It was, and is identically the same as Exhibit No 3 with the exception that at the time I copied it I asked Mr. Aylsworth how many cubic centimeters to a gallon of water, and noted same down on page 3 of the note book. The reason for this was that our vessel for measuring cubic centimeters was very small, and we 719 did most of our measuring by a gallon vessel.

Q. 54. What do the notes on Aylsworth-Miller Note No. 1 represent?

A. This relates to the proportion of materials used in the manufacture of wax given to me by Mr. Aylsworth. On page 12 of the note book, I have copied this formula but increased it four times, as this is the smallest amount of wax we could satisfactorily make in the large kettles we were using.

Q. 55. As I understand it, by making the com- 720 position, such as shown in Aylsworth-Miller Note No. 1, you obtained 119 lbs. of wax without ceresin, added 340 lbs. of filtered scrap, containing 17.9 per cent. of ceresin, and obtained 459 lbs. of wax containing 12.8 per cent. of ceresin. Is this correct?

A. This is correct, and is the formula we used at that time when scrap was used.

Q. 56. Does this Aylsworth-Miller Note No. 1, indicate how much ceresin should be added if scrap is not used?

A. It does; it states to make 12 per cent. wax,

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16½ lbs. of ceresin should be added to every 100 lbs. of stearic acid, and 6¼ lbs. to every 100 lbs. of stearic for 5 per cent. wax.

Q. 57. The matter on Aylsworth-Miller Note No. 2 appears to be copied in part on page 8 of your note book, but not entirely. Do you know why this was done?

A. I wished to systematize my note book in such a way that the correct formula was put on one page with amounts of each material used, and on another page, 722 the correct description of the methods used to mix these materials.

Q. 58. Do I understand that it was always your practice to add filtered scrap in making the wax?

A. Not always, when we made wax for masters, we never used filtered scrap and when we did not have filtered scrap to use, new wax was made for the regular business.

Q. 59. How long did you continue to have charge of the wax plant at Silver Lake? 723

A. As near as I can recollect—about four years. I took charge of the wax manufacture some time during 1891 and continued to make wax until the latter part of 1894 or the middle of 1895.

Q. 60. Did you devote your entire time to this work?

A. I did not.

Q. 61. What other work did you do?

A. Part of the time I was connected with the Edison Phonograph Works, making mechanical duplicates, and 724 later on, made master records for the North American Phonograph Company.

Q. 62. Did you make mechanical duplicates for the Edison Phonograph Works before or after you went to Silver Lake?

A. Before, the duplicating plant was later moved to Silver Lake.

Q. 63. And did you make any mechanical duplicates at Silver Lake?

725

A. I did, at the same time I supervised the making of wax and did all the analyzing.

Q. 64. When did you commence work with the North American Phonograph Company to make mechanical masters ?

A. Sometime during the year 1893.

Q. 65. How long did you continue to work with the American Phonograph Company ?

A. Until September 1894.

726 Q. 66. How do you fix this date ?

A. About this time the North American Company went into the hands of the Receiver and Mr. Walcutt and myself, and two others, formed a co-partnership and bought out their record plant, which was then at 14th Street in New York City. This co-partnership was called—Walcutt, Miller & Company.

Q. 67. After the formation of Walcutt, Miller & Company, did you still have charge of the wax manufacture at Silver Lake ?

727 A. I did. All the time I was connected with the North American Company and the greater part of the time I was a member of the firm of Walcutt-Miller & Company, I supervised the manufacture of wax for the Edison Manufacturing Company.

Q. 68. What do you mean by "supervised"?

A. That I had full charge of the manufacture of the wax and that I was solely responsible for the results obtained, and that all the formulas were made out by myself.

728 Q. 69. Did you spend all of your time at Silver Lake ?

A. I did not. I would spend an hour or so there three or four times a week. What analyzing was to be done, was sent to my house, which I would do evenings.

Q. 70. How long did you have supervisory charge of the plant at Silver Lake ?

A. As near as I can recollect—about four years or more.

Q. 71. Who succeeded you ?

729

A. J. W. Aylsworth.

Q. 72. You don't remember when it was, do you, that Mr. Aylsworth succeeded you?

A. As near as I can recollect, my work finished in the latter part of 1894 or the middle of 1895 when Mr. Aylsworth took care of the position.

Q. 73. When Mr. Aylsworth succeeded you was the plant still located at Silver Lake?

A. Yes, it was.

Q. 74. Who had charge at Silver Lake of the actual 730
weighing of the ingredients and making up the formula.

A. The Edison Manufacturing Company had a building in which they employed some 15 or 20 making Edison-Lalande battery supplies at Silver Lake, and Mr. Higgins was foreman of this department, and during my absence, he would supervise any details in the manufacture of wax and weigh out the materials. There was also a man by the name of Sloan, who
would be allowed to do this work occasionally. 731

Q. 75. Did Mr. Higgins know the formula.

A. As far as I know, he did not know the percentages, or how they were figured, but my formula was always handed to him and he would, no doubt, know how to make new wax, but did not know how to proportion the recovered material when it was used.

Q. 76. Did you give your formulas to Mr. Higgins?

A. I did.

Q. 77. Did those formulas indicate the weights of
the several ingredients? 732

A. They did.

Q. 78. Did you ever witness an experiment made by Mr. Aylsworth in which metallic aluminum was employed in the wax composition?

A. I did.

Q. 79. Who was present at the time?

A. Mr. Aylsworth, Mr. Higgins and myself.

Q. 80. When was this?

A. As near as I can recollect, it was on a Sunday, sometime in the latter part of 1894.

733
Q. 81. Was it before you were succeeded by Mr. Aylsworth?

A. It was.

Q. 82. Do you recall what this experiment consisted of?

A. As near as I can recollect, a solution of caustic soda was made and an aluminum powder, such as is used for coating radiators, at least that was my impression of it, was put in the caustic soda and allowed
734 to dissolve. It was then put into the stearate of soda in the same manner as the powdered stearate of alumina was, with the exception that it seemed to take much longer, as there was so much water contained in this caustic soda and aluminum that it foamed violently. After this solution was all absorbed with the stearate of soda, the ceresin was added in the usual manner.

Q. 83. Do you recall how much material was made at this time?

735 A. I cannot, as it was about this time Mr. Aylsworth was beginning to take active charge of the manufacture of wax.

Q. 84. If Mr. Aylsworth was beginning to take active charge of the wax at this time, are you sure that it was in 1894 that the experiment in question was carried out?

A. As I said before, I cannot positively recollect at what time I discontinued making wax. I believe that it was the latter part of 1894 or middle of 1895.

736 Q. 85. Are you familiar with blanks made at the present time by the Edison Phonograph Works?

A. I am not, as I have not made any wax since Mr. Aylsworth had taken charge.

Q. 86. I have reference to the physical properties of the modern blanks, their smoothness and general physical character, rather than their process of manufacture. From this point of view, are you familiar with modern phonograph blanks?

A. I am.

Q. 87. How do the modern blanks compare in their physical properties with the blanks made by you at Silver Lake for the North American Phonograph Company in 1891 and thereafter ? 737

A. There is no perceptible difference.

Q. 88. You say that the firm of Walcutt-Miller & Company was organized in September, 1894. How long after that firm was organized did you exercise a supervisory control over the wax manufacture at Silver Lake ?

A. That I do not recollect. 738

Q. 89. I show you six phonograph records, which have been introduced in this case as Exhibits for defendant, ("Defendant's Exhibit, Erminy Record," "Defendant's Exhibit Parlor, Orchestra Record," "Defendant's Exhibit, Gypsy Song Record," "Defendant's Exhibit, 23rd Regiment Band Record," "Defendant,s Exhibit, Hungarian Band Record," and "Defendant's Exhibit, Cornet Solo Record") and ask if you can identify the same ?

A. I can and would say that they were made under 739 my supervision and are duplicate records. I refer particularly to the Hungarian Band, Cornet Solo, Parlor Orchestra and the Gypsy Song records.

Q. 90. How are you able to identify these records ?

A. By the method of labelling, and the labels on same.

Q. 91. Can you state when records similar to these were made ?

A. They are mechanical duplicates and made prior to 1893. 740

Q. 92. Why do you know these records were made prior to 1893 ?

A. At that time I discontinued making mechanical duplicates for the Edison Phonograph Works, and the making of records was turned over to the North American Phonograph Company, which department I had charge of and where we only made original records.

Q. 93. How do you know that the four records which you have particularly identified are mechanical duplicates made prior to 1893 ?

174

A. Because all records which had the peculiar curve on the end in which a printed label could be inserted were only manufactured in duplicates. There might have been an occasional discard master among them, but this did not happen very often.

Q. 94. When the North American Phonograph Company began to make original records and duplicating was discontinued, did they retain the particular arrangement of end label which appears on the records you are now considering ? 742

A. They did not. The same curve was used at the end of the record that was made by the Works in trimming the blanks originally.

Q. 95. How many duplicate records similar to those you are now considering did you make before duplicating was discontinued ?

A. That I do not recollect. It was over several thousand.

Q. 96. What was done with the duplicate records which you made ? 743

A. I delivered them to the shipping department of the Edison Phonograph Works, and presumed they were shipped to the North American Phonograph Company for their sub-companies.

Q. 97. Did you ever see these duplicate records in public use prior to 1893 ?

A. Yes, I have seen these exhibited on slot machines.

Q. 98. Do you know anything about the extent of the phonograph business from 1890 to 1894 ? 744

A. As near as I can recollect, the volume of business was very limited in comparison to now.

Q. 99. I call your attention to six other records, which have been introduced as exhibits for defendant, (" Defendant's Exhibit, Farenell Record," " Defendant's Exhibit, Chapel Record," " Defendant's Exhibit, Violin Record," " Defendant's Exhibit, P O Record," " Defendant's Exhibit, Quartet Record," and " Defendant's Exhibit, Sea Breeze Record,") and

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ask you if you ever saw any records similar to these before ?

A. I have.

Q. 100. Where did you see them ?

A. I assisted in making them in the Lecture Room of the Laboratory.

Q. 101. When was this ?

A. These records were made prior to the duplicate records, which I have already testified about, although 746
I do not recollect the exact date.

Q. 102. Were the six records to which I last drew your attention made before you took charge of the Silver Lake plant ?

A. They were.

Q. 103. In making the wax composition at Silver Lake, was it your practice to gradually raise the temperature of the mass from 300 F. to 430 F. and to maintain the latter figure until foaming ceases, as stated on page 8 of your note-book ?

747
A. It was, for the reason that as soda is added the melting point of the composition increases.

Q. 104. How long did it take for the foaming off? That is to say, until foaming ceases.

A. As near as I can recollect—about two hours.

> By Mr. Massie: The deposition of this witness is objected to as irrelevant and immaterial; and complainant's counsel declines to cross-examine.
>
> Signature and certificate waived. 748

Adjourned until December 29th, 1905, (Friday) at 10.15 A. M.

749

Orange, N. J. December 29th, 1905.

Met pursuant to adjournment.

Present: Counsel as before.

A. Theo. E. Wangemann.

A. Theo E. Wangemann, a witness produced on behalf of defendant, having been first duly sworn, testi-
750 fies in answer to questions proposed by Mr. Dyer as follows:

Direct examination by Mr. Dyer:

Q. 1. Give your name, age, residence and occupation?

A. A. Theo E. Wangemann, age—50 years, residence—West Orange, N. J., occupation—experimenter in the Edison Laboratory for the National Phonograph
751 Company.

Q. 2. How long have you been connected with the phonograph business?

A. Since the Spring of 1888.

Q. 3. Where was this?

A. In the Edison Laboratory at West Orange.

Q. 4. What were your duties at that time?

A. Experimenting and recording of the human voice and of music on the phonograph.

Q. 5. What was the character of the phonograph
752 blanks at that time?

A. The phonograph blanks used at that time were were of a light yellow sticky wax mass, not very thick in diameter.

Q. 6. How did they compare with phonograph blanks of the present time?

A. The cutting of the stylus on the blanks of today is of an entirely different character from the yellow wax. The yellow wax being softer and very sticky, while on tho other blanks the shaving and the chip cut out by the stylus blows off freely, and clean.

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Q. 7. What was the condition of the phonograph business in 1888, when the yellow wax records were used?

A. We had in the Laboratory a number of phonographs of what was known as the square Bloomfield type, manufactured at Bloomfield, New Jersey. Mr. Edison was experimenting on a new type phonograph, of this there were two, three, possibly four machines, in running order at times. One or two of these machines I had in room No. 13 for experimental purposes. 754 The Phonograph Works were building at that time, but no machines were turned out until late in the Fall of 1888. In the Summer of the year 1888, Mr. Edison had built by hand 21 phonographs of the new type. In May and June of 1888, two machines had been built, which went to London.

Q. 8. When did the Phonograph Works begin to turn out machines in considerable quantities?

A. In the Fall of 1888, the first machines came from the Phonograph Works. It may have been in October 755 or November.

Q. 9. Did you continue to use the yellow composition for the blanks throughout the year 1888?

A. For general experimenting we used the yellow composition until beginning of the year 1889, but in the Fall of 1888, we would receive for testing purposes half or full sized pieces of blanks turned over to me by Mr. Edison, Mr. Aylsworth or Mr. Arthur Payne. Sometimes we received a half a dozen, a dozen, or two dozen of these blanks. 756

Q. 10. Can you produce a record made by you on any other composition than the yellow wax you have referred to prior to January 1, 1889?

A. I have here a record which was made on December 16th of 1888. It is announced in my own voice, cut with a round knife on a brown wax composition. The announcement is made that I was playing a record on December 15th, 1888, for Mr. John Ott, Superintendent of the Laboratory, and after the an-

757 nouncement, there is playing on the piano of this record. I played the piano myself.

Q. 11. Does the year 1888 appear in the announcement of this record, and if not, how do you fix that year?

A. The year 1888 is not announced in the announcement, but it is the only December that I was working in the Edison Laboratory. In 1889 in December I was in Europe, and in December 1890 and 1891, I was
758 working for the Edison Company in New York.

Q. 12. May not this record have been made after 1891?

A. It could not have been, because the record was turned over in 1888 to Mr. John F. Ott, who had it in his possession until the summer of 1905.

Q. 13. Do I understand that this is the only record of this type that was made in 1888?

A. The blank of this record was one of perhaps one or two dozen, which had been made and turned over
759 to me as very good for language and for music in December of 1888. Previous to receiving this sample, a number of small samples had been tried and experimented upon, and Mr. Edison had a larger number made for experimental purposes of this composition.

> The record referred to by the witness is offered in evidence and marked "Defendant's Exhibit, Wangemann 1888 Record."

760 Q. 14. Was this style of blank so far as you know, ever regularly adopted by the Edison Phonograph Works? I have reference to the record just introduced.

A. We received from the Phonograph Works during the beginning of 1889, three or four times a week, a number of blank records, and the appearance of these records in color was changed a trifle, but the character of the blanks were about the same, as I understood they were changing the composition of the

761 blanks as made in the Phonograph Works every few weeks.

Q. 15. Can you tell me what the situation in the Phonograph business was early in 1889, and especially whether machines were being manufactured by the Edison Phonograph Works and what kind of blanks were being made ?

A. From the Fall of 1888 and beginning of 1889 machines were turned out by the Phonograph Works and round blank records were manufactured. These 762 were similar in color, and some were darker than the record which has just been introduced. This record is about as light as any we had at that time.

Q. 16. Where were you in the summer of 1889 ?

A. In the summer of 1889, I was in Europe for Mr. Edison.

Q. 17. When did you go to Europe ?

A. About the middle of June, 1889.

Q. 18. When did you return ?

A. I returned about March 10th, 1890. 763

Q. 20. What was your purpose in going to Europe ?

A. The phonograph exhibit at the Paris Exhibition in 1889, had been reported to be poorly as compared with the results shown in the Laboratory, and Mr. Edison sent me over there primarily to have the phonograph exhibit run as well as possible.

Q. 21. What did you do in Europe ?

A. After I had seen to the proper exposition of the phonograph in the exhibit, I started to make records in Paris, to show the phonograph outside of the ex- 764 hibition in a quiet place to scientists, to artists, and celebrities. I also lectured to a great extent to the societies on inventions of Mr. Edison.

Q. 22. Did you visit any other cities besides Paris ?

A. I was in Paris until about September 2nd, in Berlin, Germany until about October 22nd, in Vienna until about December 8, and I travelled occasionally for two or three days to different places, and the middle of December to Cologne, and visited through

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January to different cities, and about the middle of February I returned to Paris.

Q. 23. Did you make any records anywhere else than in Paris?

A. I made phonograph records in nearly every city I travelled through.

Q. 24. What kind of blanks did you use for making these records on?

A. I took with me 3 barrels of blanks of a brownish color, as made in the Phonograph Works at that 766
time and used by all the Phonograph companies at that time. I had shipped to me every ten days or two weeks one barrel of blanks, about three or four barrels a month. Sometime in August the shipment of blanks stopped and on my inquiry I received notice from the Laboratory that a different blank, better adapted for recording music would be out soon and I would receive the same. In September on inquiry to the Phonograph Works I received a notice that shipments would be continued very soon. 767
The first shipment of these new blanks I received in Vienna; altogether I probably received somewhere from 16 to 22 barrels, about 150 to 180 in a barrel.

Q. 25. What was the objection to the blanks which you took over with you and those which you received up to the time of the notice, to which you have referred?

A. A certain percentage of the blanks, when used for recording would change in several weeks on the surface, 768
and some of them would show spots of mold.

Q. 26. How large a percentage of these blanks developed this moldy surface?

A. As far as my recollection goes, I should judge 60 or 70 per cent. It is a fact that any of these records when run over and shown for exhibition purposes, would not show this deterioration, or mold. The mold only developed when the record was not being used.

Q. 27. Was this defect of the surface true of the blanks which you received in Vienna, and which

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followed the notice that new blanks would be sent you?

A. The blanks received in Vienna, after being recorded, would keep their glossy clean surface; some of these records today, are just as clean as when they were made, except possibly for the dust.

Q. 28. I understand then, that you still have in your possession, some of the records made by you in Europe, both at Paris on the blanks which developed the moldy appearance referred to, and at Vienna, which were 770 made on the new blanks?

A. I have a few of these records as described above.

Q. 28. Can you obtain samples of these records and produce the same at the Session next week?

A. The records referred to are in storage and I will try to obtain them by next week, if possible.

Q. 30. Can you produce any records disclosing the moldy appearance of the surface to which you have referred?

A. I have here a record made in Boston in March or 771 April of 1889. The name—Tucker, on the inside, is the artist who made the record, and another record is marked " Boston H v B ", the latter initials mean Hans von Buelow, the well-known European pianist, who is now dead. This latter record was made in the Music Hall at a public concert at a distant of about 70 or 80 feet from the piano.

Q. 31. What were you doing in Boston at this time?

A. I was sent to Boston by Mr. Edison to experiment and try to get the Hans von Buelow records as 772 played on the stage at Music Hall, also to take some records of Boston singers and musicians. I was there four weeks at Chickering Hall.

Q. 32. Are you sure that this was before you went to Europe?

A. The trip to Boston was made before I went to Europe. The trip was made in March and April of 1889.

Q. 33. Were these blanks the only kind that you had in Boston?

773

A. They were not, I had with me three or four different kind of blanks, some made in the Phonograph works and some made in the Edison Laboratory. Of the latter, there were never very many of any one kind.

Q. 34. Were the two records which you have referred to made by Tucker and Hans von Buelow formed on blanks made by the Phonograph Works or at the Laboratory?

A. These blanks referred to were made in the Phonograph Works. 774

> The records referred to by the witness are offered in evidence and marked "Defendant's Exhibit, Tucker 1889 Record," and "Defendant's Exhibit, von Buelow 1889 Record," respectively.

Q. 35. Do you recall the manufacture of phonograph dolls in the early days of the phonograph?

A. I do.

775 Q. 36. When and by whom were these phonograph dolls made?

A. The phonograph dolls were made in the grounds of the Edison Phonograph Works in the brown building, that is now used by the Edison Manufacturing Company. This was in 1888 and 1889.

Q. 37. What kind of records were used on these phonograph dolls?

A. Some of the dolls had records made of soft metal, and some of the dolls made at other times had records made of brown wax, dark brown and light brown. 776

Q. 38. What do you mean by "at other times."

A. The dolls were made in 1888, 1889 and 1890.

Q. 39. Can you produce one of these doll records or blanks?

A. I produce one of these doll records to which I have referred.

Q. 40. How do you know that these doll blanks or records were not used after 1890?

A. The manufacturing of the Edison phonograph dolls was stopped either during my absence from the

777 United States to Europe, or shortly afterwards, because when I returned the manufacture of the Edison phonograph dolls was stopped, and to my knowledge, has never been resumed.

Q. 41. How many of these phonograh dolls were made and sold from 1888 to 1890?

A. A great number were sold, but the exact data I had nothing to do with. They were sold by the Edison Toy Manufacturing Company, and on Christmas time were on sale by the large stores in New York. 778

Q. 42. And as I understand it, these dolls were provided with records similar to the one you have produced?

A. Some of the dolls had records like the one produced, other dolls had records made out of a metallic composition.

Q. 43. Do you remember whether any of the dolls which were made for the Christmas trade of 1888 were provided with records like the one produced?

A. That I couldn't state, but I do remember having 779 taken to Paris in 1889, a few rings both in French and English language to be put in the dolls on Exhibition in the Paris Exposition. I also had made a few rings for the Exposition in Paris, after rigging up a recording machine over there, for recording on these wax rings.

Q. 44. Are you able to state whether any phonograph dolls were manufactured, using records similar to the one produced, and sold in this country before you left Europe in 1889?

A. I cannot so state, for I had no connection with 780 the Edison Toy Manufacturing Company, except that the superintendent Mr. Batchelor, who questioned me on devices for recording and recorders.

Q. Did you ever have a phonograph doll before you went to Europe, having a record similar to the one produced?

A. I did have in my possession a complete phonograph doll, which I turned over to a child to play with, with the object of finding out how long the ring in the doll would last, before the child would either break

781 the ring, by rough handling of the doll, or if the record became very inaudible as to be useless as a speaking doll. This doll lasted as near as I remember, about two weeks, when the ring was broken by the child throwing the doll down stairs. This was somewhere in May of 1889.

782 The doll record referred to by the witness is offered in evidence and marked "Defendant's Exhibit, Doll Record".

Q. 46. I show you what purports to be a small sized blank in a brown paste-board box, and ask if you can identify the same, and if so, what is it?

A. The small blank phonograph record in the brown paper paste-board box is a phonograph mailing cylinder. Late in 1888 and beginning of 1889, Mr. Edison was experimenting on sending phonograph records by mail for commercial purposes, and the cylinder blank shown to me is a blank which 738 was used in one of these Experiments. Mr. Edison had built two machines with all the necessary apparatus attached to record or reproduce both on the ordinary size cylinder and by removing the mandrel, that blank would fit on the shaft, the speaker and the recorder both could be lowered so as to reach the surface of this blank. Also, the shaving off knife could be used. One machine was sent to the London office, and one machine was kept here in the Laboratory, and 784 a number of these records went to London from Orange, back and forth. This was in 1889.

Q. 47. Was it before you went to Boston in that year?

A. It was before and after I returned from Boston, but these messages to London and from London would arrive every week or two, immaterially whether I was here or not.

The record in the brown paper box containing it, is offered in evidence and marked "Defendant's Exhibit, Mailing Cylinder."

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785 Q. 48. Do I understand that this is one of the original boxes for containing the cylinders?

A. It is one of the experimental boxes made at that time.

Q. 49. Do you know when it was that the North American Phonograph Company started actively in business?

A. They were in existence during the building of the Phonograph Works, and they started to do business with the 21 hand-made machines, made in the Laboratory; 786 about September, 1888, they commenced to do business after the Phonograph Works began to deliver phonographs to them. With these phonographs went some brown blanks always. Previous to September, 1888, the only machines on which phonographic reproductions could be made or shown were the square phonograph machines from Bloomfield, and on these we used exclusively yellow wax records. How many of the Bloomfield machines the North American Phonograph Company had, I do not know. 787

Q. 50. Did you ever make musical records for the North American Phonograph Company?

A. I never made records for the company direct, but under my supervision there were made a great many hundred records in the Edison Laboratory, which went to the North American Phonograph Company and the sub-companies.

Q. 51. When was this?

A. During the latter part of 1888; Mr. Edison wanted to find out the cost of making musical records, and we 788 occasionally would run for one or two days. In January or February of 1889, the blanks were obtainable in larger numbers and by the end of February and March, we had rigged up to run and manufacture up to 250 to 300 musical records in the hours from 10 to 4. This was kept up during my absence to Boston, and a long time after I left for Europe.

Q. 52. Do you know what became of these musical

789 records which were made before you went to Boston and before you went to Europe ?

A. We divided these records in three classes ; very good, good and fair. The first two classes were sent down as called for from the Phonograph Works. The ones marked fair, were shaved off and the blank used over again.

Q. 53. On what blanks were these records made ?

A. These blanks were made on light brown, medium
790 brown, dark brown, some reddish color, some pinkish color wax. Some were threaded inside to fit the mandrel. Some were smooth-bored inside. Some had spiral ribs inside. Some were threaded very coarsely and some had tape instead of thread inside. We also had a rubber shell which fitted our mandrel and threaded records to fit over this rubber shell, the outside of the shell being only a very thin layer of the raw material from which the blanks were made.

Q. 54. Were the blanks used for these musical
791 records similar to those used by you at Boston and shown in " Defendant's Exhibit, Tucker 1889 Record " and " Defendant's Exhibit, von Buelow 1889 Record " ?

A. A large percentage of the blank records received were of this type. Others were similar to the piano record of John Ott, (Defendant's Exhibit Wangemann 1888 Record). As near as I recollect, the blank records of every batch would slightly vary in color.

Q. 55. Do you recall an exhibition in Minneapolis in the early 90's ?

792 A. I do.

Q. 56. When was this exhibition ?

A. The Exhibition was in September and October of 1890.

Q. 57. Did you go there ?

A. I did. I left about the middle of August for the Exhibition.

Q. 58. For what purpose ?

A. I went there to have charge of the exhibit of 24 phonographs.

Q. 59. Who was running this Exhibit ?

793 A. The Paris exhibit of Mr. Edison was loaned to the Minneapolis Exposition, but I don't know whether the exhibit of phonographs was made by the Phonograph Works, or the North American Company. I reported to Mr. Edison direct and to Mr. Francis R. Upton of the Harrison Lamp Works who had made all arrangements for the loan of the Edison exhibit.

Q. 60. What was done by you at the Minneapolis Exposition?

A. I run about 20 machines on musical records, 794 about two machines on talking records, and two machines I had set up for making musical records in the Exhibition Building.

Q. 61. Did you actually make records at the Minneapolis Exhibition?

A. I did, but not for exhibition purposes to any degree.

Q. 62. What do you mean by the last answer?

A. I mean the musical records which I exhibited on the 20 machines running all day and the evening I 795 had taken with me from the Laboratory. Records that I made in the Exhibition Building were records sung or played by local talent, occasionally I would exhibit some of these.

Q. 63. What kind of blanks were used by you at Minneapolis?

A. Five or six different shades of brown, some blank reamed, some spiral reamed, and some threaded. Blank records at that time were very scarce, and we used for recording most anything we could get. 796

Q. 64. Why was it that at this time, blank records were very scare?

A. The number of blanks shipped from the Phonograph Works to the North American and sub phonograph companies, was together, with the constant changes in manufacture, about all that the Phonograph Works could do, and here in the Laboratory we constantly run short of blanks and were requesting more and more all the time.

Q. 65. Were the blanks which were used at Minne-

797 apolis like those received by you at Vienna in November, 1889, or similar to those used by you at Boston?

A. They were similar to the Viennese records; some of these records had a different finish on the edge than any received in Europe.

Q. 66. I call your attention to a box of a dozen records, and ask if you can identify the same?

A. The one dozen records shown in this box are some of the records which I exhibited in Minneapolis
798 in 1890, in the fall. They were made in the Edison Laboratory.

Q. 67. How do you know that these records are some of the records which you exhibited at Minneapolis?

A. At the close of the Exhibition, I packed up by request from the Laboratory, one case of twelve dozen records. A number of phonograph auxiliaries, etc., in one special box, which was marked for Mr. F. R. Upton, and shipped with the balance of the exhibit to
799 the Edison Lamp Works at Harrison, N. J., for Mr. Upton, who was superintendent at that time. Mr. Upton, after my return, thanked me for attending to this matter, and spoke to me telling me how delighted he was with the records.

Q. 68. Is there any other way by which you can tell whether these are some of the original Minneapolis records?

A. I can tell by the threaded records, that they were made at the time and because the threaded records
800 were discontinued somewhere around 1891. I have run over some of the records and know from the titles that they were of the lot of records made about that time. The paper bands that are around some of these records are in the hand-writing of a girl I used to employ, by the name of Julia Miller.

Q. 69. Did you employ Miss Miller before or after you went to Europe?

A. Julia Miller was working in the Phonograph Works and any time I needed her for any experiments or for record making or testing, I sent for her, to be

801 there several days a week, sometimes several weeks in succession. This was from the time we started to manufacture the records, from February 1889 on.

Q. 70. When did you again come into possession of the dozen records you are now testifying about?

A. Late in the Spring of 1905.

Q. 21. Under what circumstances?

A. I had been asked what recollection of the old wax cylinders I had, and one day Mr. Upton came to my room, No. 13 Laboratory, and I asked him if he 802 had some of the records which he received from the Minneapolis exhibit, still in his possession. He answered me, that about three-quarters of them I have in my house and have not been used for years, as I have no phonograph to run them on. I requested Mr. Upton to let me have a few and he replied—"you can have them all, they are no use to me." A few days later, I sent a wagon after them, had them brought to my room, where they have been kept since. 803

> The dozen records referred to by the witness are the twelve records introduced as Exhibits on behalf of defendant following Q. 18 of the deposition of Francis R. Upton, and marked respectively "Defendant's Exhibit, Erminy Record", "Defendant's Exhibit, Parlor Orchestra Record" "Defendant's Exhibit, Gypsy Song Record", "Defendant's Exhibit, Twenty-third Regiment Band Record", "Defendant's Ex- 804 hibit, Hungarian Band Record", "Defendant's Exhibit, Cornet Solo Records", "Defendant's Exhibit, Farewell Record", "Defendant's Exhibit, Chapel Record", "Defendant's Exhibit, Violin Record", "Defendant's Exhibit, B O Record", "Defendant's Exhibit, Quartette Record", and "Defendant's Exhibit, Sea Breeze Record".

Adjourned until Wednesday, January 3d, 1906, at 10.15 A. M.

805

Orange, N. J. January 3, 1906.

Met pursuant to adjournment.

Present: Counsel as before.

Examination of Mr. Wangemann Continued.

Q. 72. Can you now produce some of the records
made by you in Europe, showing the composition that
806 you made use of in Paris, that developed the foggy
surface, and those made in Vienna and later on what
you have referred to, as the improved composition?

A. I have here a box which I carried through Europe in 1889 and 1890 and containing 21 records, which
were made in Europe. Of these twenty-one, five are
broken; the rest of them are apparently intact. Some
of these records are the voices of the Crown Prince of
Germany and two other children of the Emperor, Bismark, Von Moltke, and several other people now deceased.
807

Q. 73. Did you bring these records back with you from Europe?

A. I carried this box of records always myself and I brought them back here to the United States.

Q. 74. Where have they been in the meantime?

A. They were first in the Laboratory for a few
weeks, when Mr. Edison presented the phonograph I
had with me in Europe to me, and asked me to take
care of these records. I carried them over to my resi-
808 dence in West End Avenue in New York, and in Fall
1891 until about 1893, they were in my residence at
Flushing, and after that, they were stored in a fireproof vault in Brooklyn until January 2nd, 1906, when
I went over to Brooklyn and brought them over to the
Laboratory again. The box itself was locked with a
rope around it. I have in my possession a number of
other boxes, also stored either in Brooklyn or Flushing, and containing records made during this period of
my visit to Europe.

Q. 75. Of the lot of records which you produced to-

809 day, can you spare one that was made before the so-called "new composition" blanks were sent you in Vienna, in the Fall of 1889?

A. I have here a record, which was made on the blank cylinder, which I had in Paris. It contains a record of the Strauss Orchestra. It was made in the first part of my stay in Vienna. I had at that time not received the barrel of the new records.

> The record referred to by the witness offered 810
> in evidence and marked "Defendant's Exhibit, Strauss Record."

Q. 76. Of this box of records can you produce one made after you received the barrel of new blanks at Vienna?

A. The record I now produce is a record made on a blank received at the end of 1889; it is a record of the great German Wagnarian tenor Heinrich Goetze. It was made in Cologne, Rhenish Prussia, in January 811
1890. The song is entitled "Zweo Auglein braun."

> The record referred to by the witness is offered in evidence and marked "Defendant's Exhibit, Goetze Record."
>
> The other records produced by the witness are offered to complainant's counsel for inspection for purposes of cross-examination.

Q. 77. Can you produce a record made on what you 812
have referred to as the "yellow wax" composition that was used in 1888?

A. I produce here a record, made on this yellow wax in 1888. We used these records for experimenting up to February and March of 1889; from the Fall of 1888 I would receive a number of blank records from Mr. Edison Mr. Aylsworth and Mr. Arthur Payne, these blanks being made of different material. Sometimes full sized blanks, sometimes only part of blanks; occasionally when the composition of these sample

813 blanks was very good and very promising for making musical records, Mr. Edison had made six, eight, ten and twelve samples for testing purposes. We had them in Room 13 and used the blanks after they had been recorded upon for showing musical records. All of these blanks were occasionally shaved off and new records put on them. The record produced and called "yellow wax" was at that time referred to either as "yellow" or as "white" blanks.

814 Q. 78. Were these yellow wax records used after the Spring of 1889 for experimental or any other purpose?

A. They were not used for experimental purposes after we commenced to get blanks manufactured in the Phonograph Works.

Q. 79. What blanks do you refer to in your last answer?

A. I refer to blanks threaded and unthreaded such as used in Boston in April, 1889.

815 The record referred to by the witness is offered in evidence and marked "Defendant's Exhibit, Yellow Wax Record."

Q. 80. Where did the Phonograph Works manufacture blanks, prior to your departure to Europe?

A. At the other end of the yard from the Laboratory in the last building in West Orange.

Q. 81. When you returned from Europe, did you again enter the Laboratory?

816 A. I entered the Laboratory on my return from Europe.

Q. 82. Do you remember where the blanks were then manufactured?

A. I do not remember where they were manufactured at that time, but we received daily from the Phonograph Works from ten to twenty dozen blanks for the purpose of making musical records in Room 13.

Q. 84. Do you know what became of the musical records which were made by you at the Laboratory after your return from Europe?

817

A. The musical records after they were assorted and tested, were sent to the Record Store Room of the Phonograph Works to be shipped on orders. I have occasionally seen and heard some of the records made on phonographs in New York City and in slot machines. I daily saw and heard slot machines after my return from Minneapolis, and at different ferries in New York City, and especially saw one in one hotel near 34th Street. They had on these nickel in the slot machines
records made by Walter Miller and other concerns in 818
New York, like the New York Phonograph Company, etc.

Q. 84. At how early a date, did you see these records used on slot machines in New York City?

A. The first slot machine that I saw was shortly after my return from Europe. I also remember distinctly that the question came up if any slot machines should be sent over to the exhibition at Minneapolis. The slot machines in general use at ferries and public,
places like Koster & Bials, corner 24th Street and 6th 819
Avenue were in use in 1891. I tested them repeatedly. In Koster & Bials, I would occasionally hand to Mr. Koster a few specially loud records for his machines. This was during 1891, 1892, 1893.

Q. 85. Do I understand that the records which you gave Mr. Koster in 1891 to 1893 for use on his slot machines were made in the Laboratory?

A. They were not. They were records which were made in my own home in New York or Flushing, and
the records would be put on a nickel in the slot ma- 820
chine for perhaps twenty minutes or half an hour and I always took them away with me again.

Q. 86. What blanks were used in the manufacture of these records for slot machines?

A. Blanks made in the Phonograph Works at West Orange.

Q. 87. How did those blanks compare with those used by you in Europe after you received the new lot in Vienna?

A. As far as the shaving and cutting the records for

821 recording was concerned, these blanks acted very much alike. We would receive some lots which were especially good, and others not quite as good.

Q. 88. Did you make phonograph records after 1893, and if so, when and under what circumstances?

A. I had no connection with any Phonograph Company after the Spring of 1893, but always kept up making experiments of phonograph improvements in my own home, when my time permitted me to do so. 822 For over two years, I kept one phonograph in Steinway Hall, 14th Street, and experimented there perhaps two or three times in an afternoon each week. Occasionally, I would make up a box of records and bring them out to Mr. Edison. I had in Steinway's the pleasure of recording a great many of the best musicians, both vocal and instrumental.

Q. 89. When was this?

A. 1894, 1895, 1896. Even later than that I took in different places of New York, singers like Lillie Lehmann, and others. 823

Q. 90. What kind of records were used in these experiments?

A. I used the regular phonograph blanks and occasionally I would shave off one of the old experimental blanks, such as I had in my possession.

Q. 91. What do you mean by regular phonograph blanks?

A. By regular phonograph blanks, I mean blanks which hae been turned out by the Phonograph Works, 824 similar to those that were turned out after 1890 and 1891.

Q. 92. Are you familiar with modern phonograph blanks, similar to the blank, which I now show you, (Defendant's Exhibit, Modern Blank)?

A. I am. The blanks shown to me is a blank regularly manufactured in the Phonograph Works, shaved off in Building 20, and sent from there to my room.

Q. 93. How do these modern blanks compare, in their physical properties, with the blanks made by the Phonograph Works in 1890, and thereafter?

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825

A. These blanks in shaving off and recording act similar. In material to my liking for recording music, they are a trifle softer, but the shave off and waste from the recording knife is much freer than in the years of 1890 and so on.

Q. 94. What do you mean by "freer"?

A. The chips from the cutting knife blow off easy and the necessity for brushing the record, when finished, is nearly eliminated.

Q. 95. I show you a record (Defendant's Exhibit, 826
Upton Record) and ask if you can identify the same?

A. The record shown to me is a home-made record recorded on a regular phonograph blank. The record contains speaking by Mr. Francis R. Upton, and a number of relatives of his. This record I found in a lot of about eight dozen, which were sent by Mr. Upton to my room in the Spring of 1905.

Adjourned until Tuesday, January 9th, 1906, at 11
A. M. 827

Counsel for defendant understands that at the next session, Mr. Mauro will be present for the purpose of cross-examining the witnesses heretofore produced, and will then be prepared to attend the examination of future witnesses, so that their cross-examination may be continued immediately following their direct examination.

The witness, A. Theo E. Wangemann is produced for 828
cross-examination by Mr. Mauro.

> Complainant's counsel objects to all the exhibits introduced during the direct examination of this witness on the ground that proper foundation for their introduction has not been made.

Cross-examination by Mr. Mauro:

x-Q. 96. How long have you been employed in the Edison Laboratory? I refer to your present term of service?

829

A. I have been employed by the National Phonograph Company with a room first in Building 20 of the Phonograph Works, and in the last three years in room 13 of the Laboratory since the Fall of 1902.

x-Q. 97. What was the brown wax composition which you say you used in December 1888?

A. The brown wax composition which was used in
December 1888 was a few sample records turned over
to me from the Chemical Department of the Labora-
830 tory to experiment with to try to make musical records
on, especially piano records.

x-Q. 98. Do you know what it was made of?

A. I do not. I had nothing to do with the mixing or making of phonograph blanks or samples.

x-Q. 99. Had you any way of distinguishing it from any other brown wax composition?

A. None, except paper slips which are put in these samples at the time, and kept there and sometimes the records would have marks on them.

831 x-Q. 100. You say that "Defendant's exhibit, Wangemann 1888 Record" was turned over in 1888 to Mr. John F. Ott. When did you next see it after 1888?

A. The record was brought to Room 13 in the Laboratory in the early part of 1905 by Louis Ott, Mr. Ott's son, at my request to compare some of the present piano records with some of the old ones made. It has been in my possession ever since.

x-Q. 101. Then previous to 1905, you had not seen it for 17 years, is that the case?

832 A. That is correct. I recognize the record by the announcement which is in my own voice, by the peculiarities by the playing on the piano.

> Complainant's counsel renews his objection to this exhibit, and further objects to it as incompetent.

x-Q. 102. So far as you know, was this brown wax composition used for any except for experimental purposes?

A. As far as I know, there were a few of these wax blanks made at that time experimentally.

x-Q. 103. You have stated that the exhibit "Tucker 1889 Record" and the exhibit "von Buelow, 1889 Record" were made on blanks manufactured by the Phonograph Works or at the Laboratory. Did you see those blanks made?

A. I did not see the blanks made, but at that time we received from the Phonograph Works, blanks in lots of from four to ten dozen for recording purposes, the blanks which I took to Boston I ordered from the Phonograph Works myself, had them packed and brought by hand to the Grand Central Station in a box. A number of other blanks were shipped to Boston a day or two afterwards. The reason for my ordering these blanks was that I left for Boston on very short notice, as I remember about three hours, von Buelow having asked Mr. Edison if his playing of the Beethoven Sonatas could be done in one of his concerts, and Mr. Edison ordered me at that time to go to Boston and take them.

Answer objected to as incompetent.

x-Q. 104. Where have those records been since 1889?

A. These records, before my departure to Europe were wrapped up, put in a black box and firmly fastened, and they have been in the storeroom of the Edison Laboratory until about August or September, or in the Fall of 1903. From that time on, they have been in Room 13 of the Laboratory in my possession. Most of them have not even been unwrapped.

Answer objected to as incompetent relating to matters which are not within personal knowledge of the witness.

x-Q. 105. Did you have charge of the storeroom during the fourteen years, during which you say these records have been lying there?

837

A. I have not.

x-Q. 106. What personal knowledge have you of "Defendant's Exhibit, Doll Record"?

A. During 1888 and 1889 during the making of the doll records, I was consulted by the record makers of the doll records as to diaphragms, points and recorders, and many a time I had for experimental purposes a doll-ring recording machine in Room 13, but the manufacture of the doll records in the Phonograph
838 Works, I have no further knowledge.

x-Q. 107. What I want to know is what personal knowledge you have of that particular exhibit?

A. The wax ring exhibited under the name of "Defendant's Exhibit, Doll Record," was sent for by me at the time that I was testifying brought up by Louis Ott and the ring was removed by Louis Ott from the Mechanical part of the doll phonograph.

x-Q. 108. The fact is that you have no personal knowledge of that exhibit prior to the day it was put
839 in evidence in this case?

A. I have seen this exhibit in a box in the Library a number of times in past years, when looking for some old models for experimental purposes, for Mr. Dyer or Mr. Edison, and I sent Louis Ott to get the phonograph doll record out of that box.

x-Q. 109. By past years, do you mean from 1902 to the present time?

A. Yes, I also mean that I knew in the early 90's that samples of old experiments had been stored
840 away in different parts of the Laboratory building. In fact I stored a good many away myself.

> All of the answer after the word "Yes" is objected to as incompetent and immaterial; and complainant's counsel renews his objection to "Defendant's Exhibit, Doll Record."

x-Q. 110. Please state what personal knowledge you have of "Defendant's Exhibit, Mailing Cylinder"?

A. During the Fall of 1888 and beginning of 1889

841 when the phonograph for the small mailing cylinder was being built, I occasionally tried to record on these mailing cylinders. The mailing cylinder exhibited was taken out of a box containing a number of these cylinders, some asphalt interior, some threaded; this box was situated in one of the cupboards on the top floor of the Edison Laboratory, where a great many of the old experiments are kept. I have seen and shown samples of these mailing cylinders to a number of visitors to the Laboratory during the last few years. 842

Answer is objected to as not responsive.

x-Q. 111. Is that all you can say as to your personal knowledge of "Defendant's Exhibit, Mailing Cylinder?"

A. That is all, except that I have seen cylinders and listened to cylinders sent through the mail from London, previous to my departure for Europe.

843

Complainant's counsel now renews his objection to "Defendant's Exhibit, Mailing Cylinder".

x-Q. 112. Referring to the box of a dozen records, introduced during the deposition of Francis R. Upton, had you seen those records or any of them between 1889 and the Spring of 1905?

A. The first time I saw these records was in 1890; they were made in 1890. From the time somewhere in October 1890 when I shipped them from Minneapolis to 844 Mr. Francis R. Upton to Harrison, N. J. until the Spring of 1905, I have not seen them.

Complainant's counsel renews his objection to said exhibit.

x-Q. 113. Referring to "Defendant's Exhibit, Gotze Record", do I understand that that record has been in your personal possession since it was made?

A. The record was in my possession during the en-

845 tire time, except when it was securely locked in a box and stored.

x-Q. 114. Who had access to that box besides yourself?

A. This box, as far as I know, no one had access to, except people who I stored it with. The box had not been opened and was in the same condition as I delivered it. It was well taken care of.

x-Q. 115. It was out of your possession about 13
846 years, was it?

A. Yes, about 12 or 13 years.

x-Q. 116. Has it the foggy surface you spoke about in your deposition?

A. It was taken out of the box on January 2nd, 1906 in the presence of Mr. Aylsworth and no fog on the surface showed, and after fixing the speaker to reach the surface, it reproduced Heinrich's Goetze's voice, my own voice, and the piano playing the same as the record had been made in January 1890 in
847 Cologne, Germany.

Re-direct Examination by Mr. Dyer:

Re-d. Q. 117. Having reference to "Defendant's Exhibit, Tucker Record", how do you identify this as having been made by you in April 1889?

A. The Tucker Record was taken by me from the above mentioned black box in which the von Buelow record was kept, and others with tissue paper around
848 and had then never been unwrapped, the inside of the record was marked in my own hand-writing "Tucker". I took this record run it over, and the beginning of the announcement I found in my own voice the announcement as being made in April 1889. Furthermore, it is exactly like all the records which were turned out in the beginning of 1889 by the Phonograph Works with the thread on the inside.

Re-d. Q. 118. I find on the inside of this record the word "Tucker". In whose hand-writing is this?

A. I have said that it was in my hand-writing.

849 Re-d. Q. 119. When was this word written on the record?

A. After the record had been made and before the same had been put in some box; for purposes of identification I used to mark every one of these threaded records that way. This record was marked in Boston on the date it was made.

Re-d. Q. 120. Having reference to "Defendant's Exhibit, von Buelow Record", how do you identify this, as an original record made in Boston in 1889? 850

A. This record is marked in my own hand-writing "H von B Boston". I have run over a number of these von Buelow records, found same dated; they were made in Music Hall, Boston at a concert, in April 1889, by myself, marked, brought to the Laboratory and packed up in the black box before my departure for Europe. The record exhibited has not been run over, since it was made.

Re-d. Q. 121. How do you know that this record has not been run over. 851

A. I can tell this from the peculiar foggy surface. The moment the speaker ball runs over the surface, the so-called "fog" falls off like a powder; after running over certain place of say—½ inch, ten or twelve times, the original color of this wax comes back, after all of the dust, or so-called "fog" is removed by the speaker ball.

Re-d. Q. 122. Please run over this von Buelow record and ascertain whether it contains an announcement, and if so, quote the same on the record? 852

A. It contains an announcement, which has been run over in the presence of counsel Mr. Mauro and Mr. Dyer, saying Hans von Buelow, Music Hall, Boston, 17th of April 1889. The announcement is made in a very low voice as Mr. von Buelow was playing at the time.

Re-d. Q. 123. Were the mailing cylinders that you heard, prior to your departure to Europe, similar to "Defendant's Exhibit, Mailing Cylinder"?

A. We had a great many kinds of mailing cylinders,

853

some in yellow wax, some in brown wax, some on celluloid, collodian and other substances. A number of the records which I did hear were of the type as exhibited.

Re-d. Q. 124. What kind of shaving knifes were used on the phonographs in 1890?

A. In 1890, we had already the sapphire shaving knifes, practically the same form as the present shaving knife.

854 Re-d. Q. 125. When was the present form of sapphire shaving knife adopted?

A. The sapphire shaving knife was adopted by the Phonograph Works sometime during my absence in Europe. The sapphire shaving knifes were made experimetally in the very early Spring of 1889. The phonograph which I had in Europe was equipped with sapphire shaving knifes, and I took with me a number of these knifes and fitted out every phonograph at the Paris Exposition with these knifes at the end of June 855 1889.

Re-d. Q. 126. What kind of knifes were used before the sapphire knifes?

A. Directly before the use of sapphire knifes, we had a steel knife, made out of a peculiar carbonized steel, practically the same form as the sapphire and fastened to the phonograph in the same manner. Before that Mr. Edison and the different experimenters made a very great many shapes and forms of knifes for cutting the surface of the wax cylinders properly. There 856 was a great change in the form of the knifes when we changed over from the yellow wax to the brown wax, and the experiments covered a number of months.

Re-d. Q. 127. Were the steel knifes used after the advent of the brown wax composition, after December 1888?

A. The steel knifes were used, but they would not last any length of time.

Re-d. Q. 128. What was the character of the shaving obtained with the steel knife, in comparison with the sapphire knife?

857

A. The steel knife of the same shape as the sapphire, would cut on the first two or three run-overs of the cylinders or blanks as good and even better as a sapphire, after that they deteriorated rapidly. The shaving with a properly set knife of steel would in the beginning come off as free as the shaving from a sapphire knife. A sapphire knife, properly set, would shave blanks a great many thousand times without deteriorating.

858

RE-CROSS-EXAMINATION BY MR. MAURO:

Re-x-Q. 129. Did all the blanks you used at the concert in Boston turn moldy on the surface like those put in evidence?

A. As far as I have examined, the records which are in my possession made at the beginning of 1889 by the Phonograph Works of that peculiar type, threaded inside, all will turn foggy in a very few weeks, and now where they are old, when cleaned they will re-fog very 859
rapidly.

Re-x-Q. 130. If a record containing an announcement were used as a master on the duplicating machine ten years after it was made, the duplicate record would contain the same announcement date and all, would it not?

A. It would, provided the announcement of this record had been also duplicated, and the original had not been disturbed.

Signature and certificate waived. 860

861

JANUARY 10th, 1906.

Met pursuant to adjournment.

Present: FRANK L. DYER, ESQ., for Defendant.

Mr. Dyer states that by arrangement with Mr. Mauro, Counsel for complainant, he proceeds with the examination of the next witness in Mr. Mauro's absence, reserving, however, to Mr. Mauro the right of
862 objection to any of the questions and to any of the exhibits which may be introduced.

George B. Redfearn.

GEORGE B. REDFEARN, a witness produced on behalf of defendant, having been first duly sworn, testifies in answer to questions proposed by Mr. Dyer, as follows:—

863 DIRECT EXAMINATION BY MR. DYER:

Q. 1. Give your name, age, residence and occupation?

A. George B. Redfearn, age—32, residence—5 Hawthorne Street, Orange, occupation—cost clerk.

Q. 2. By whom are you employed?

A. The Edison Phonograph Works, National Phonograph Company and Edison Manufacturing Company.

864 Q. 3. What are your duties as cost clerk?

A. To compute costs of the various articles manufactured by the above companies.

Q. 4. How long have you been connected with the companies mentioned?

A. With the Edison Phonograph Works since January 1889, with the National Phonograph Company since its organization, which I think was sometime in the Spring of 1896, and I think it was about 1899 before I had anything to do actively with the Edison Manufacturing Company.

865

Q. 5. Did you ever have anything to do with the purchase of supplies for any of the companies mentioned?

A. I had practical charge of the purchases of the Edison Phonograph Works beginning sometime in the Summer of 1894, until about 1900.

Q. 6. What do you mean by "practical charge"?

A. I issued the purchase requisitions, if necessary,
wrote for estimates on the goods to be furnished, saw
that the material arrived about at the time required 866
and approved the prices on the invoices rendered.

Q. 7. After you took charge of the purchase of materials for the Edison Phonograph Works, did you purchase any material for that concern for the manufacture of wax compositions?

A. Yes, sir, I bought stearic acid, caustic soda, ceresin, sal-soda and aluminum.

Q. 8. From whom did you buy stearic acid in 1896?

A. From R. G. Mitchell & Company.

Q. 9. Can you produce any bills from R. G. Mitchell 867
& Company, showing the purchase of stearic acid by
the Edison Phonograph Works in 1896?

A. I produce five vouchers, to which are attached
bills of R. G. Mitchell & Company, showing the purchase of stearic acid from R. G. Mitchell & Company.
The first voucher is No. 1949, for the month of June
1896, containing bill of R. G. Mitchell & Company,
dated June 10th, 1896, for 3077 pounds net of solid
stearic acid at 9c. per pound, the amount of the bill
being $276.93. The second voucher, No. 1899, for 868
June 1896, contains two bills of R. G. Mitchell & Company, the first dated June 17th, 1896 for 3099 lbs. net
of solid stearic acid at 9c. per pound, amounting to
$278.91, and the second bill being dated June 4th, 1896
for 3076 pounds of solid stearic acid at 9c. per pound,
amounting to $276.84. The third voucher No. 2008 for
July 1896, contains two bills of R. G. Mitchell & Company, the first dated July 1st, 1896, for 3047 pounds
net solid stearic acid at 9c. per pound, amounting to
$274.23, and the second bill dated July 8th, 1896 for

869 3106 pounds of solid stearic acid at 9c. per pound amounting to $279.54. The fourth voucher No. 2031 for July 1896 contains a bill from R. G. Mitchell & Company dated July 31, 1896, for 3098 pounds net of solid stearic acid at 9c. a pound, amounting to $278.82. The fifth voucher No. 2362 for December 1896 contains five bills of R. G. Mitchell & Company, the first dated December 7th, 1896 for 920 pounds of solid stearic acid, the second, dated December 14th, 1896, for 870 911 pounds of the same, the third dated December 18th, 1896 for 1217 pounds of the same, the fourth dated December 21st, 1896 for 913 pounds of the same, and the fifth dated December 28th, 1896 for 927 pounds of the same, the cost in each case being 9c. per pound, and the amount of the entire voucher being $439.92.

Q. 10. Having reference to R. G. Mitchell & Company's bill of June 10th, 1896, I observe that the bill was apparently made out to the Edison Manufacturing 871 Company and changed to the Edison Phonograph Works. Can you explain this?

A. This represents a shipment made to the Edison Manufacturing Company. About that time, the Edison Phonograph Works began the manufacture of wax at Orange. This bill was returnd to R. G. Mitchell & Company and transferred to the account of the Edison Phonograph Works.

Q. 11. How do you know that the stearic acid re- 872 presented by this bill was shipped to the Edison Manufacturing Company?

A. Attached to the voucher is a shipping receipt of the Erie Railroad Company, dated June 10th, 1896, showing the receipt from R. G. Mitchell & Company of ten barrels of stearic acid consigned to Edison Manufacturing Company, Orange, New Jersey.

Q. 12. I observe on this bill of June 10th, 1896, the impressions of two rubber stamps. What do these represent?

A. The stamp enclosed in a margin is one that was

873 used at that time by the Edison Manufacturing Company; the other was used by the Edison Phonograph Works.

Q. 13. Having reference to the Phonograph Works stamp, can you tell me what the initials "J. S." represent?

A. They are the initials of John Schneider, who at that time was my assistant.

Q. 14. On the same stamp I find a signature in lead pencil. Do you know whose signature this is? 874

A. That is the signature of C. Aschinger, who had charge of the wax-making department.

Q. 15. I notice that the voucher to which this bill of June 10th, 1896, is attached, is signed "A. Westee." Do you know who Mr. Westee is?

A. Mr. Westee is general auditor of the several Edison Companies at Orange, and at that time was auditor.

Q. 16. Having reference to voucher No. 1899 of June, 1896, did you have anything personally to do with the two bills of R. G. Mitchell & Company, which 875 are attached thereto?

A. I certified that the price was correct.

Q. 17. How do you know this?

A. Because part of the stamp reads "Price O. K." to which I have applied my initials, on both bills.

Q. 18. When did you approve these bills, that are made a part of this voucher?

A. All bills were sent to me immediately upon their receipt, and I would examine them and approve them generally on the same day. 876 The two bills attached to voucher No. 1899 were approved by me in June, 1896.

Q. 19. I observe on both of these bills the initials "M. F. B." Do you know what these letters represent?

A. They are the initials of M. F. Bradley, who was in charge of the raw material stock-room at that time, and who is now in the same position.

Q. 20. Having reference to vouchers No. 2008 for July 1896, No. 2031 for July 1896 and No. 2362 for

877 December 1896, did you approve the several bills which are attached to those vouchers?

A. I approved all of these bills, except the bills of July 8th, 1896 and July 31st, 1896, which were approved by my assistant, John Schneider.

Q. 21. In answer to Q. 10, you state that about June 10th, 1896 "the Edison Phonograph Works began the manufacture of wax at Orange." Where and by whom was the wax composition made before that date?

878 A. By the Edison Manufacturing Company at Silver Lake.

Q. 22. How do you know that the wax composition was made at Silver Lake? Did you ever work there?

A. No, I did not work there, but issued various orders for a stated quantity of wax to the Edison Manufacturing Company, who had no factory except at Silver Lake.

Q. 23. That is to say—on behalf of the Edison Phonograph Works, you ordered the wax composition 879 from the Edison Manufacturing Company?

A. Yes.

Q. 24. Can you produce any original bills showing the purchase of phonograph wax by the Edison Phonograph Works from the Edison Manufacturing Company?

A. I produce vouchers, showing these purchases for the months of April, May, June, July, August, October and November 1894; January, February (two vouchers) March, April, May, June, July, October, November 880 and December 1895; January, February (two vouchers), March, April, and May 1896.

Q. 25. Having reference to the voucher of the Edison Phonograph Works for April 1894, to which is attached a bill of the Edison Manufacturing Company of April 18th, 1894, what connection, if any, did you have with the transaction referred to therein?

A. I approved this bill as storekeeper.

Q. 26. Were you storekeeper for the Edison Phonograph Works in April 1894?

A. At that time, I acted as general shop clerk and

881 among other duties, had charge of the raw material storeroom.

Q. 27. What was your practice in approving these bills?

A. The practice was to check the bill against the receipt of the goods, and after such checking to return the bills to the office.

Q. 28. What was the practice of the Edison Manufacturing Company in reference to submitting bills for phonograph wax? 882

A. The practice was to render bills immediately after delivery of the wax to the Edison Phonograph Works by wagon from Silver Lake.

Q. 29. How soon after the bills were turned over to the Phonograph Works did you compare them with the shipment, and if correct, approve them?

A. These bills were handed to the Edison Phonograph Works and were immediately sent to the Storeroom for approval. This approval was made immediately if we had a record of the receipt of the ship- 883
ment, which was the case of this bill of April 18th, 1894.

Q. 30. Did the Edison Manufacturing Company and the Edison Phonograph Works occupy different offices in Orange in April 1894?

A. No, they occupied the same office.

> Voucher of Edison Phonograph Works No. 73 of April 1894, referred to by the witness
> is offered in evidence and marked "Defend- 884
> ant's Exhibit, Wax Voucher April 1894."

Q. 31. Referring now to Phonograph Works voucher of August 1894, I find attached to it a bill from the Edison Manufacturing Company, dated August 8th, 1894, on which appears a rubber stamp impression. Did you have any connection with this bill?

A. I checked the extension.

Q. 32. Was it your practice in checking these extensions to do so before or after the vouchers were made out?

885 A. It was, is and always has been, the invariable custom to check bills separately before the vouchers are made out.

Q. 33. Kindly ascertain from the several vouchers that you have presented the total amount of phonograph wax composition billed from the Edison Manufacturing Company to the Edison Phonograph Works between April 1894 and May 1896?

A. The total amount is slightly over 178000 pounds,
886 and the cost was slightly over $38.000.

Q. 34. Please ascertain the total amount of phonograph wax billed from the Edison Manufacturing Company to the Edison Phonograph Works for the seven months from April 1894 to October 1894 inclusive?

A. Approximately 41000 pounds, the cost of which was $8757.09.

> Counsel for defendant offers for the purposes of cross-examination, the several vouchers referred to
> 887 by the witness, dated from April 1894 to May 1896.

Q. 35. From whom did the Edison Phonograph Works purchase ceresin in 1896, after it began to manufacture the wax composition at Orange?

A. From Smith & Nichols and F. G. Strohmeyer & H. Arpe.

Q. 36. Can you produce bills, showing the purchase of ceresin by the Edison Phonograph Works?

888 A. I produce five vouchers of the Edison Phonograph Works, the first No. 1919 for June 1896 with attached bill from Smith & Nichols for 615 pounds of white ceresin at 12.5 cents per pound, amounting to $76.88; the second No. 1920 for June 1896 with three bills attached from Strohmeyer & Arpe, the first of these bills being dated June 16th, 1896 for 222 lbs. net white ceresin at 11½ cents, amounting to $25.53, the second bill dated June 18th, 1896 for 891 lbs. net, prime white ceresin at 11½ cents, amounting to $102.47, and the third bill dated June 26th, 1896 for

889 664 lbs. of white ceresin, at 11½ cents, amounting to
$76.36. The third voucher No. 2018 of July 1896,
applies to two bills of Strohmeyer & Arpe, dated July
6th and July 11th, 1896, for 444 lbs. net and 664 lbs.
net respectively of white ceresin at 11½ cents, the
amount of the voucher being $127.42. The fourth
voucher No. 2152, for September 1896 applies to two
bills of Strohmeyer & Arpe, dated September 11th and
September 21st, 1896 respectively, the first for 443 lbs.
net and the second for 666 lbs. net of white ceresin, at 890
11½ cents, the amount of the voucher being $127.54.
The fifth voucher No. 2377 for December 1896, applies
to two bills of Strohmeyer & Arpe, dated December
8th, 1896 for 222 lbs. net and 892 lbs. net of white
ceresin at 11½ cents, the amount of the voucher being
$128.11.

Q. 37. What, if any connection, did you have with
the several bills which are attached to the vouchers
you have just referred to?

A. I approved all of these bills except the bills of 891
Strohmeyer & Arpe of June 16th, 1896, July 6th 1896
and July 11th, 1896. On all of these bills, however,
the word "Material" or the abbreviation thereof
"Mat'l" is in my handwriting. I wrote this word on
bills to show what account the material purchased was
to be charged to, and this was done before the vouchers
were prepared.

Q. 38. From whom did the Edison Phonograph
Works buy caustic soda after it commenced the manu-
facture of the wax composition at Orange? 892

A. From Welch, Holme & Clark Company.

Q. 39. Can you produce any bills, showing the pur-
chase of caustic soda from this concern?

A. I produce two vouchers, one No. 2022 for July
1896, to which is attached a bill from this concern for 112
pounds of "Golden Fleece 98 per cent powdered caustic
soda" at 5½ cents, amounting to $6.16; and the sec-
ond voucher No. 2380 for December 1896, to which is
attached a bill from the same concern for 60 lbs. of

893 the same material at 6 cents a pound, amounting to $3.60.

Q. 40. What, if any connection did you have with these bills?

A. On the bill of July 24th, 1896, I approved the price, and on that of December 2nd I approved the price and checked the extension.

Q. 41. From whom did the Edison Phonograph Works buy sal-soda, when it commenced to make the
894 wax composition at Orange?

A. From Martin Kalbfleisch Chemical Company.

Q. 42. Can you produce any bills, showing the purchase of sal-soda from this concern?

A. I produce three vouchers, one No. 1892 for June 1896, to which is attached a bill from this concern for 2250 lbs. of sal-soda at 85 cents per 100 lbs. and on the same bill 375 lbs. at 90 cents per 100 lbs. the total of the bill being $22.51. The second voucher No. 2080, to which is attached a bill from the same concern for
895 2250 lbs. of sal-soda at 85 cents per 100 lbs., the amount of the bill being $19.13. The third voucher No. 2358 of December 1896, to which is a bill attached for 1125 lbs. of sal-soda at 90 cents per 100 pounds amounting to $10.12.

Q. 43. What connection, if any, did you have with these sal-soda bills?

A. I approved the price of all of them and checked the extensions on the bills of August 31st and December 11th, 1896.

896 Q. 44. Was this done before the vouchers were made out?

A. Yes.

Q. 45. From whom did the Edison Phonograph Works purchase metallic aluminum after they commenced to make the wax composition at Orange?

A. From the Pittsburgh Reduction Company.

Q. 46. Can you produce bills, showing the purchase of metallic aluminum, say between June 15th, 1896 and October 1897?

A. I produce eleven vouchers: the first No. 1908 of

897
June, 1896, to which is attached two bills, both dated
June 15th, 1896, the first for 2 lbs. of No. 1 ingredient,
the second for 28 lbs. of No. 1 ingredient; the second
voucher No. 1990 for July, 1896, to which is attached
a bill of the same concern for 25 lbs. 15 ounces sheet
No. 25 Hard Aluminum at 72 cents per lb., the amount
being $18.68; the third voucher No. 2147 for September, 1896, to which is attached a bill from the same
concern for 10 lbs. 4 ounces of No. 25 Sheet at
72 cents per lb., the amount of the bill being $7.38; 898
the fourth voucher No. 2212 for October, 1896, to
which is attached a bill from the same concern for
10 lbs. 8 ounces of No. 25 Sheet at 72 cents, the amount
of the bill being $7.56; the fifth voucher No. 2370 of
December, 1896, to which is attached a bill from the
same concern dated December 8th, 1896, for 20 lbs.
12 ounces of No. 25 Sheet at 72 cents, amounting to
$14.94; the sixth voucher No. 2463 for January, 1897,
to which is attached a bill of the same concern dated
January 6th, 1897, for 20 lbs. 3 ounces No. 25 Sheet at 899
72 cents per lb. amounting to $14.54; the seventh
voucher No. 2546 for February, 1897, to which is
attached two bills from the same concern, the first
dated January 22d, 1897, for 25 lbs. 13 ounces of
No. 25 Sheet at 59 cents per lb. amounting to $15.23,
and the second bill dated February 9th, 1897, for
25 lbs. of No. 25 Sheet at 64 cents per lb., amounting
to $16; to this seventh voucher is attached a credit
memorandum dated February 16th, 1897, reducing the
price charged on the invoice of February 9th from 900
64 to 59 cents, the amount of this credit memorandum
being $1.25; the eighth voucher No. 2661 of March,
1897, to which is attached three bills, the first dated
March 1st, 1897, calling for 1 lb. of No. 1 ingredient
at $1.75, the second dated March 5th, 1897, for 25 lbs.
4 ounces of No. 25 Sheet at 59 cents, amounting to
$14.90, the third dated March 22d, 1897, for 25 lbs. of
No. 25 Sheet at 59 cents per lb., amounting to $14.75;
the ninth voucher No. 2765 of April, 1897, to which
is attached a bill dated April 15th, 1897, for

901 25 lbs. of No. 25 Sheet at 59 cents, amounting to $14.75; the tenth voucher No. 2877 for May, 1897, has attached thereto a bill dated May 5th, 1897 for 25 lbs. 9 ounces of No. 25 Sheet at 64 cents, amounting to $16.36; the eleventh voucher No. 4234 of October, 1897, has attached thereto a bill dated October 12th, 1897, for 103 lbs. 6 ounces .0179″ sheet 12″ wide at 59 cents, amounting to $50.99.

Q. 47. Having reference to the bills of the Pitts-
902 burgh Reduction Company, to which you have just referred, dated respectively June 15th, 1896, (two bills) and March 1st, 1897, relating to "No. 1 Ingredient"; do you know what this refers to?

A. It was aluminum powder.

Q. 48. When and through what source did you ascertain that aluminum powder was referred to as "No. 1 ingredient"?

A. Shortly before we began the use of sheet aluminum in July 1896, Mr. Charles Aschinger, who was
903 then foreman of the Wax-making Department informed me that this material was aluminum powder.

Q. 49. Did you ever purchase aluminum powder from the Pittsburgh Reduction Company direct?

A. In June 1896 I visited the wareroom of the Pittsburgh Reduction Company in New York, I think on Church Street between Cortlandt and Dey, and obtained a small quantity of aluminum powder. I asked for No. 1 ingredient for the Edison Phonograph Works and was supplied with the aluminum powder. I am
904 quite certain that this is the two lbs. referred to in the bill of the Pittsburgh Reduction Company of June 15th, 1896. At any rate, the purchase was prior to the time we began to buy sheet aluminum.

Q. 50. What, if any connection, did you have with the several bills of the Pittsburgh Reduction Company that you have produced?

A. I approved the price of all of them with the exception of that of July 21st, 1896. I checked the extensions on all of them, except those of June 15th

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1896 and July 21st, 1896. I checked the receipt of the material billed under date of October 14th, 1896.

Defendant's counsel, of the several vouchers produced by the witness, offers in evidence voucher No. 1908 for June 1896, showing the purchase of aluminum powder and the same is marked "Defendant's Exhibit, Aluminum Voucher June 1896," and voucher of September 1896, showing the purchase of sheet aluminum, 906 and the same is marked "Defendant's Exhibit, Aluminum Voucher September 1896". The other vouchers and bills produced by the witness are offered to complainant's counsel for purposes of cross-examination.

Defendant's counsel also offers in evidence voucher No. 1899 of June 1896, containing bills of R. G. Mitchell & Company for stearic acid, and the same is marked "Defendant's Exhibit, Stearic Acid Voucher, June 1896". The other stearic 907 acid vouchers produced by the witness and previously referred to by him are offered to complainant's counsel for purposes of cross-examination.

Defendant's counsel also offers in evidence voucher No. 1892 of June 1896, produced by the witness and the same is marked "Defendant's Exhibit; Sal-soda Voucher, June 1896". The other vouchers produced by the witness, showing the purchase of sal-soda by the Edison 908 Phonograph Works are offered to the inspection of Complainant's counsel for purposes of cross-examination.

Defendant's counsel also offers in evidence voucher No. 2022 of July 1896, produced by the witness and the same is marked "Defendant's Exhibit, Caustic Soda Voucher July 1896." The other voucher showing the purchase of caustic soda by the Edison Phonograph Works is offered

909 to complainant's counsel for purposes of cross-examination.

Defendant's counsel also offers in evidence, voucher No. 1919, of June 1896 produced by the witness and the same is marked "Defendant's Exhibit, Ceresin Voucher June 1896". The other vouchers showing the purchase of ceresin by the Edison Phonograph Works and produced by the witness are offered to Complainant's
910 counsel for purposes of cross-examination.

Defendant's counsel also offers in evidence, voucher No. 122 of May 1894, showing the purchase of phonograph wax by the Edison Phonograph Works from the Edison Manufacturing Company, and the same is marked "Defendant's Exhibit, Wax Voucher May 1894". Defendant's counsel also offers in evidence voucher No. 484 of October 1894, produced by the witness, showing the purchase of phonograph wax by
911 the Edison Phonograph Works from the Edison Manufacturing Company, and the same is marked "Defendant's Exhibit, Wax Voucher October 1894."

The numerous other vouchers produced by the witness, showing the purchase of phonograph wax from the Edison Manufacturing Company between June 1894 and April 1896 are offered to the inspection of complainant's counsel for purposes of cross-examination.

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Q. 51. Have you, at my request, made a search through the records of the Edison Manufacturing Company and of the Edison Phonograph Works for vouchers, showing the purchase by either of those concerns, prior to June 1896 when the Edison Phonograph Works commenced the manufacture of wax composition at Orange, of stearic acid, ceresin, sal-soda, caustic soda, alum, and acetate of alumina?

A. I have. I spent more than a week on this search.

Raymond R. Wile Research Library

913

Q. 52. Kindly produce the vouchers found by you on your search, showing the purchase of stearic acid?

A. The following vouchers which I produce show purchases by the Edison Phonograph Works of stearic acid from A. Gross & Company on the dates, at the rate, in the amount and at a cost as follows:—

Voucher No. 44 Jan. 1889—2034 lbs. at 10¼ c.—total—$208.48.

Voucher No. 293 March 1889—2009 lbs. at 10¼c.—total— $205.92. 914

Voucher No. 435 April 1889—4040 lbs. at 10¼c.—total—$414.10.

Voucher No. 580 May 1889—8233 lbs. at 10¼c.—total—$843.88.

From R. G. Mitchell & Company:

Voucher No. 622 May 1889, 150 lbs. at 15c.—total $22.50.

Voucher No. 754 June 1889, 2335 lbs. at 10½c.—total $245.18.

915 Voucher No. 904 July 1889, 11882 lbs. at 10½c.—total $1247.63.

Voucher No. 1047 August 1889, 11827 lbs. at 10½c.—total $1241.85.

Voucher No. 1174 Sept. 1889, 4771 lbs. at 10½c.—total $500.96.

Voucher No. 1294 Oct. 1889, 4770 lbs. at 10½c.—total $500.85.

Voucher No. 1550 Dec. 1889, 7116 lbs. at 10½c.—total $747.19.

916 Voucher No. 120 Jan. 1890, 2282 lbs. at 10½c.—total $250.11.

Voucher No. 24 Jan. 1890, 2425 lbs. at 10½c.—total $254.63.

Voucher No. 52 Jan. 1890, 2388 lbs. at 10½c.—total $250.74.

Voucher No. 169 Jan. 1890, 2392 lbs. at 10½c.—total $251.16.

Voucher No. 335 Feb. 1890, 2384 lbs. at 10c.—total $238.40.

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Voucher No. 443 Feb. 1890, 2348 lbs. at 10c.—total $243.80.

Voucher No. 620 Mar. 1890, 2372 lbs. at 10c.—total $237.20.

Voucher No. 687 Mar. 1890, 2349 lbs. at 10c.—total $234.90.

Voucher No. 743 Apr. 1890, 2338 lbs. at 10c.—total $233.80.

918 The following vouchers, show purchases of stearic acid from the firms noted by the Edison Manufacturing Company, in amounts at the rates and with the totals noted:—

From R. G. Mitchell & Company

	Voucher No.	Date		Amount	Rate	Total
	441	April,	1892	4221	9c.	$379.80
	603	June,	"	297	9c.	26.73
919	671	July,	"	1511	9c.	135.99
	1406	April,	1893	1211	13c.	157.43
	1468	May,	"	1184	13c.	153.92
	1539	June,	"	609	13c.	79.17
	1615	July,	"	1827	13c.	237.51
	1714	Aug.,	"	2109	13c.	274.17
	1783	Sept.,	"	1194	13c.	155.22
	1850	Oct.,	"	1203	13c.	156.39
	28	Nov.,	"	608	13c.	79.04
	84	Dec.,	"	1156	13c.	150.28

920

From the Edison General Electric Co.—Lamp Works.

67.....Dec. 1893.... 299..... 8c.....$ 23.92

From J. W. Aylsworth.

1378....April 1893..... 278.... 8c.....$ 22.24

921

From Procter & Gamble Co.

184	April	1894	2064	8.97c.	$ 185.14	
243	May	"	3860	9.37c.	361.68	
283	June	"	9994	9.20c.	919.45	
377	July	"	3950	9.20c.	363.40	
489	Sept.	"	4235	9.48c.	401.47	
489	Sept.	"	4068	9.48c.	385.64	
610	Oct.	"	4095	9.48c.	388.19	
764	Dec.	"	6367	9c.	573.03	
860	Jan.	1895	12728	9c.	1145.52	922
940	Feb.	"	2097	9c.	188.73	

From R. G. Mitchell & Company.

51	March	1895	617	12c.	$ 74.04
Same voucher			2101	10c.	210.10

From Procter & Gamble Co.

126	April	1895	1900	8.75c.	$ 166.25

923

From R. G. Mitchell & Company.

113	April	1895	2152	10c.	215.20
191	May	"	4286	10c.	428.60
Same voucher			12911	9½c.	1226.54
417	July	"	2154	9½c.	204.63
637	October	"	4258	9½c.	404.51
711	Nov.	"	2146	9½c.	203.87
789	Dec.	"	2152	9½c.	204.44

From A. Gross & Company. 924

769	Dec.	1895	10	9c.	.90

From R. G. Mitchell & Co.

912	Feb.	1896	4278	9½c.	$ 406.41

From A. Gross & Co.

907-A	Feb.	1895	1969	8¾c.	172.29
983	March	"	17816	8¾c.	1366.41
1069	April	"	2213	8¾c.	193.64

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From R. G. Mitchell & Co.

994	March 1895	2160	9½c.	205.20
1080	April "	4267	9½c.	405.37
1181	May "	12332	9c.	1109.85

From A. Gross & Company.

1160	May 1896	311	8¾c.	$ 27.21

Q. 53. In your search were you able to find any bills, 926 showing the purchase of stearic acid by the Edison Phonograph Works or the Edison Manufacturing Company, between April 8th, 1890, and March 16th, 1892?

A. The stearic acid bills which I have produced are all that I was able to find. The records of the Edison Phonograph Works are very complete, and I am quite sure that the Phonograph Works did not purchase stearic acid after April 1890 until they again commenced to manufacture the wax at Orange in 1896, except that from time to time the Phon- 927 ograph Works purchased relatively small batches of stearic acid from the Edison Manufacturing Company between April 8th, 1890 and June 1896 for addition to the wax composition in the Molding Department. The records of the Edison Manufacturing Company are not in very good shape, and I was not able to find any stearic acid bills prior to March 16th 1892. The records show that the Edison Phonograph Works began to purchase wax from the Edison Manufacturing Company in May 1890.

928 Q. 54. Can you produce bills showing the purchase of phonograph wax from the Edison Manufacturing Company by the Edison Phonograph Works in May 1890 and subsequent thereto.

A. I produce a large number of vouchers of the Edison Phonograph Works with attached bills of the Edison Manufacturing Company, showing the purchase of phonograph wax in May, June, July, August, September, October, November, December of 1890, February, March, April, May, June, 1891; March, April, May, June, July and November of 1892; Janu-

929

ary, February, March, April, May, June, July, August, September, October, November and December of 1893.

Q. 55. Kindly ascertain the amount of wax represented by the vouchers you have produced as purchased from the Edison Manufacturing Company at the times referred to?

A. Between 240,000 and 250,000 pounds.

Q. 56. Please produce vouchers found by you in your search, showing the purchase of ceresin?

A. The following vouchers, which I produce, show 930 purchases by the Edison Phonograph Works of ceresin in amounts, at the rates, and with the totals noted :—

Voucher No.	Date.		Amount (Lbs.).	Rate.	Amount.	
(From Hildreth Bros. & Segelken)						
876	July,	1889	222½	13⅓c.	$ 30.04	
Same voucher			445	15c.	66.75	931
(From Smith & Nichols)						
942	July,	1889	1328	13⅛c.	174.30	
1073	August,	"	1111	13⅛c.	145.82	
1198	Sept.,	"	2212½	13⅛c.	290.39	
1318	October,	"	1105	13⅛c.	145.03	
1442	November,	"	1105	13¾c.	151.94	
1574	December,	"	2210	14c.	309.40	
34	January,	1890	1105	14c.	154.70	
259	"	"	1565	15c.	234.75	932
574	March,	"	1862	15c.	279.30	
735	April,	"	425	15c.	63.75	

The following vouchers, which I produce, show purchases by the Edison Manufacturing Company, of ceresin in amounts, at the rates and with the totals noted :—

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	Voucher No.	Date.		Amount (Lbs.).	Rate.	Amount.
	(From Smith & Nichols)					
	452	April,	1892	522½	14½c.	$ 75.69
	1245	February,	1893	136	14½c.	19.72
	1374	April,	“	273	14½c.	39.29
	1485	May,	“	288	14½c.	41.76
	1551	June,	“	286	14½c.	41.47
934	1640	July,	“	670½	14½c.	97.22
	1729	August,	“	290	14½c.	42.05
	1807	September,	“	731	14½c.	105.94
	1866	October,	“	569	14½c.	82.50
	1869	October,	“	285	14½c.	41.33
	47	November,	“	271½	14½c.	39.37
	97	December,	“	262	14½c.	37.99
	192	April,	1894	300	13½c.	39.75
	247	May,	“	1329½	13¼c.	176.16
	279	June,	“	859	13¼c.	113.84
935	399	July,	“	1899½	12¾c.	242.19
	500	September,	“	2000	11¾c.	235.00
	620	October,	“	1237½	11¾c.	145.41
	864	January,	1895	1718	11⅝c.	199.72
	942	February,	“	2334	11⅝c.	271.32
	60	March,	“	1805	11⅝c.	209.03
	314	June,	“	1995½	11¾c.	234.47
	484	August,	“	45	11¾c.	5.28
	659	October,	“	1001	11⅝c.	116.37
	728	November	“	402½	11⅝c.	46.79
936	877	January,	1896	670½	11⅝c.	77.95
	1010	March,	“	1115	11⅝c.	129.62
	1105	April,	“	1121½	11⅝c.	130.37
	1210	May,	“	130	11⅝c.	15.12
	Same voucher			1000	11⅛c.	111.25

Q. 57. Were you able, in your search to find any bills earlier than April, 1892, showing the purchase of ceresin by the Edison Manufacturing Company?

A. No, I was not. As I before said, the early records of the Edison Manufacturing Company are not in very good shape.

937

Q. 58. Were you able to find bills, showing the purchase of ceresin by the Edison Phonograph Works between April 1890 and June 1896?

A. No sir, I was not, and I am quite certain that between those dates, the Edison Phonograph Works did not purchase ceresin.

Q. 59. Can you produce vouchers showing the purchase of metallic aluminum in powdered or sheet form, or as "No. 1 ingredient" by the Edison Manufacturing Company, prior to June 1896? 938

A. The following vouchers of the Edison Manufacturing Company, showing purchases from the Pittsburgh Reduction Company:

Voucher No.	Date	Amount (Lbs.)	Rate	Amount	
646	October 1895	15 lbs. 8 oz.	$2.25	$34.88	
723	November "	21 " 8 "	2.25	48.38	
Same voucher		10 " 4 "			
		No. 2 ingredient	.58	5.95	939
802	December 1895	20 lbs.	2.25	45.00	
871	January 1896	20 "	2.25	45.00	
925	February "	20 "	2.25	45.00	
1003	March "	41 "	2.25	92.25	
1094	April "	53 " 8 oz.	2.25	120.38	
1207	May "	28 "	2.00	56.00	
1312	June "	28 " 12 oz.	2.00	57.50	
Same voucher		12 lbs. 4 oz.			
		No. 16 sheet	.58	7.11	

940 Q. 60. In connection with voucher No. 723 for November 1895, above referred to, I observe that one of the bills of November 16th, 1895, relates to "No. 2 ingredient". Do you know what this means?

A. I do not.

Q. 61. Can you produce vouchers, showing the purchase of sal-soda by the Edison Phonograph Works, or the Edison Manufacturing Company prior to June 1896, when the Edison Phonograph Works resumed the manufacture of wax at Orange?

A. I produce the following vouchers of the Edison

941

Phonograph Works, showing purchases of sal-soda from Francis H. Leggett & Company :—

	Voucher No.	Date		Amount (Lbs.)	Rate	Amount
	199	February	1889	350	95c. per 100 lbs.	$3.33
	465	April	1889	350	90c	$3.15
	605	May	"	350	90c	$3.15
	891	July	"	400	95c	$3.80
	1036	August	"	350	95c	3.33
942	1287	October	"	700	1.10c	7.70
	1539	December	"	350	1.05	3.68
	106	January	"	350	1.10	3.85
	411	February	1890	350	1.50	5.25
	683	March	"	350	1.65	5.78
	914	May	"	448	1.25	5.60

943 The following vouchers showing purchases of sal-soda from the firms noted, by the Edison Manufacturing Company, in amounts, at the rates and with the totals noted :

	Voucher No.	Date		Amount (Lbs.)	Rate	Amount
	(From Martin Kalbfleisch's Sons Co.)					
	1709	Aug.	1893	1500 lbs.	1.25	$18.75
	1536	June	"	1500 "	1.25	18.75
	1779	Sept.	"	1500 "	1.25	18.75
	1847	Oct.	"	4000 "	1.25	50.00
944	(From Martin Kalbflesch Chemical Co.)					
	225	May	1894	3816	1.25	47.70
	381	July	"	1875	1.25	23.44
	419	Aug.	"	1875	1.25	23.44
	(From Church & Co.)					
	806	January	1895	375	.65	2.44
	(From John Dwight & Co.)					
	815	January	1895	375	.65	2.44

Raymond R. Wile Research Library

945

(From Martin Kalbfleisch Chemical Co.)

921	February 1895	5200	1.00	52.00
185	May "	4125	1.00	41.25
375	July "	4125	1.00	11.25
640	October "	1125	.90	10.13
705	November "	1125	1.00	11.25
855	January 1896	2250	1.00	22.50
909	February "	1125	1.00	11.25
991	March "	4500	1.00	45.00
1178	May "	4500	1.00	45.00 946

Q. 62. Do any of the bills to which you have above referred disclose the purchase of any of the materials mention in Q. 51, other than sal-soda?

A. The bills rendered by the Martin Kalbfliesch's Son's Company and Martin Kalbfleisch Chemical Company attached to vouchers mentioned, show the purchase of alum, in amounts at the rate, and with the totals noted:

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Voucher No.	Date	Amount (Lbs.)	Rate	Amount
1709	Aug. 1893	1200	1.80	$21.60
1847	Oct. "	1200	1.80	21.60
225	May 1894	1600	1.80	28.80
381	July "	800	1.80	14.40
419	Aug. "	800	1.80	14.40

Q. 63. Can you produce vouchers, showing the purchase of caustic soda by the Edison Phonograph Works or the Edison Manufacturing Company prior to June 1896, when the Edison Phonograph Works resumed 948 the manufacture of wax at Orange?

A. I produce the following vouchers of the Edison Phonograph Works, showing the purchase of caustic soda in amounts, at the rates, and with the totals noted:

Voucher No.	Date	Amount (Lbs.)	Rate	Amount
(From Lehn & Fink)				
469	April 1889	467	5c	$23.35
749	June "	480	5.50	26.40
1037	Aug. "	471	5.50	25.90
888	July "	460	5.50	25.30

949

I produce the following vouchers, showing purchases of caustic soda by the Edison Manufacturing Company in amounts, at the rates, and with the totals noted :

950

Voucher No.	Date		Amount (Lbs.)	Rate	Amount
(From Welch, Holme & Clark Co.)					
1262	February	1893	448	5.50	$24.64
1291	May	"	462	5.50	25.41
1654	July	"	434	5.50	23.87
106	December	1893	390	5.75	22.43
255	May	"	372	5.75	21.79
401	July	"	382	5.75	21.94
869	January	1895	793	4.50	35.69
76	March	"	428	4.50	19.26
230	May	"	415	4.50	18.72
412	July	"	398	4.50	17.91

951 In considering the vouchers of the Edison Manufacturing Company, above referred to, I have not taken into account the large quantities of 74 per cent and 76 per cent caustic soda, which were purchased by that concern, and which were distributed to " Soda Account ". This means that the 74 per cent and 76 per cent caustic soda was used for the solution of what were then known as the " Edison-Lalande Primary batteries ". These batteries are now called the " Edison Primary batteries ", and the same 74 per cent or 76 952 per cent caustic soda is still used. Nor have I considered the one lot of 98 per cent powdered caustic soda appearing on bill of May 17th, 1893, forming part of voucher No. 1491 of May 1893, because that particular lot appears to have been distributed to " Soda Account ". The items of caustic soda in the bills of the Edison Manufacturing Company, which I have considered were distributed to the account of " Manufacturing wax ".

Q. 64. In addition to the references to alum in certain of the sal-soda bills, above referred to, can you

Raymond B. [illegible]
Research Library

953 produce vouchers showing the purchase of alum by the Edison Manufacturing Company, prior to June 1896?

A. I produce vouchers of the Edison Manufacturing Company, showing the purchase of alum in amounts, at the rates, and with the totals noted:—

Voucher No.	Date	Amount (Lbs.)	Rate	Amount
(From Martin Kalbfleisch's Sons Co.) 954				
1365	April 1893	1600	1.80	$28.80
1535	June "	1200	1.80	21.60
1611	July "	1200	1.80	21.60
24	November 1893	400	1.80	7.20
79	December "	400	1.80	7.20
(From Martin Kalbfleisch Chemical Co.)				
505	September 1894	800	1.80	14.40
596	October 1894	1600	1.75	28.00
(From Harrison Bros. & Co.) 955				
830	January 1895	1600	1.60	25.60
914	February "	2400	1.60	38.40
447	August "	1600	1.65	26.40
(The bill attached to this voucher is dated March 27-95.)				
181	May 1895	3200	1.65	52.80
372	July "	1600	1.60	25.60
622	October 1895	800	1.60	12.80

Q. 65. Having reference to the vouchers which you have above considered, do you find therein, purchases of any other materials mentioned in Q. 51 besides alum? 956

A. The bills rendered by the Martin Kalbfliesch's Sons Company, and Martin Kalbfliesch Chemical Company, attached to vouchers mentioned, shows the purchase of sal-soda in amounts, at the rate and the totals noted:

Voucher No.	Date	Amount (Lb.)	Rate	Amount
24	November 1893	1629	1.25	$20.36
596	October 1894	2000	1.00	20.00

957

Q. 66. Can you produce bills, showing the purchase by the Edison Phonograph Works of acetate of alumina ?

A. I produce vouchers of the Edison Phonograph Works, showing the purchase of acetate of alumina in amounts, at the rate and with the totals mentioned :—

Voucher No.	Date	Amount (Lb)	Rate	Amount
958 (E. Merck)				
210	February 1889	35	60c	$21.00
333	March "	60	60c	36.00
Same voucher	"	907	50c	453.50
476	April "	133	50c	66.50

Q. 67. Do you find any bills charging material to the Edison Manufacturing Company by Mr. Edison, relating either to phonograph wax, or to any of the ingredients referred to in question 51 ?

959 A. I find voucher No. 70. This shows that during the month of September 1899, the following materials were supplied the Edison Manufacturing Company :—

448 lbs. caustic soda, 1200 lbs. lump alum

During the month of November 1889, 2000 lbs. of lump alum, 2800 lbs. carb. soda, crystallized.

During December 1889, 2100 lbs. carbonate of soda.

During January 1890, 4480 lbs. sal-soda, crystallized.

During the month of February 1890, 2391 lbs. of
960 stearic acid, 120 lbs. alumina acetate, 923½ lbs. white ceresin.

During the month of April 1890, 4756 lbs. wax, (solid) per R. G. Mitchell & Company's bill of April 23, 562 lbs. of white ceresin.

During the month of May 1890, 2⅜ lbs. of stearic acid, 900 lbs. of stearic acid, 159 lbs. of ceresin, 1200 lbs. sal-soda crystallized, 5914 lbs. of stearic acid, 1471½ lbs wax per Smith & Nichols' bill.

I also produce the following vouchers :—

No. 418 of April 1892, showing delivery of 375 lbs. of

961
carbonate of soda (crystallized) in March 1892. Voucher No. 646 of July 1892, showing the delivery 375 lbs. of carbonate of soda in May 1892. Voucher No. 734 of August 1892, showing the delivery of 1875 lbs. of soda (crystallized) in June 1892. Voucher No. 1452 of May 1893, showing the delivery of 2450 lbs. carbonate of soda (crystallized) in April 1893.

Q. 68. Did you ever have any connection with the Billing Department of the Edison Phonograph Works? 962

A. Yes, I had charge of the Billing Department of the Edison Phonograph Works for about a year in 1897 or 1898.

Q. 69. What were your duties in that capacity?

A. I had general charge of the Billing Department force, and checked all bills before they were sent out.

Q. 70. Were any records kept of these bills?

A. A letter book impression was taken of all of them in copy books kept for that purpose.

Q. 71. Were these copy books in which the bills 963 were copied under your charge?

A. They were.

Q. 72. Did you ever have any other connection with bills rendered by the Edison Phonograph Works?

A. Sometime prior to October 1891, while working as assistant to Mr. W. E. Sargeant, who was then chief Inspector, I was called into the office, where, in conjunction with the general office staff, I assisted in making out and checking copies of all bills rendered by the Edison Phonograph Works against the North 964 American Phonograph Company prior to that time.

Q. 73. How long were you engaged in this special work?

A. About three weeks.

Q. 74. Did you work continuously on this job?

A. Yes, sir.

Q. 75. At that time did you have occasion to examine and familiarize yourself with the bill books of the Edison Phonograph Works?

A. Yes. In order to make the copies of the bills, it

965 was necessary to turn over each leaf of the said copy books, and read the same.

Q. 76. From 1891 until you took charge of the Billing Department in 1897 or 1898, did you have anything to do with the Bill books of the Edison Phonograph Works?

A. No, not directly. I did not enter the General Office until July 1894, and the old bill books dated prior to that time were then on file in the office and I
966 have since had access to them, and have had occasionally examined them to procure information from time to time.

Q. 77. When you entered the General Office in July 1894, did you recognize any of the old bill books that you had examined in 1891, when you made copies of the bills rendered the North American Company?

A. Yes sir, although there had, of course, been additions to their number covering the interval between that date and 1894.

967 Q. 77. Can you produce the bill books of the Edison Phonograph Works, showing the sale of blanks from February 1889 to November 1896?

A. I produce bill books from Nos. 1 to 20, showing bills from February 22nd, 1889 to April 30th, 1894. Also, bill books Nos. 1 to 8 of a new series, showing bills from May 1st, 1894 to April 22 1897. This latter book containing bills for November 1896.

Q. 78. Do you find from any of the bills copied in these bill books, that blanks were shipped by the
968 Edison Phonograph Works to T. H. Macdonald of Bridgeport, Connecticut?

A. I have not examined these bill books for the purpose of finding shipments to Mr. Macdonald, but I do find in bill book No. 3 on page 485 a copy of a bill reading exclusive of unimportant data, as follows:

969

" Order No. 1552

ORANGE, N. J. Jan. 27, 1890

THE NORTH AMERICAN PHONOGRAPH COMPANY
To—EDISON PHONOGRAPH WORKS, DR.

Jan. 27—1 box of 24 blanks 7½------------------1.80
Shipped to T. H. MacDonald
c/o Am. Graphophone Co. 970
Bridgeport,
Ct."

Copy of bill to Mr. Macdonald referred to by the witness and appearing on page 485 of bill book No. 3 of the Edison Phonograph Works is offered in evidence and marked "Defendant's Exhibit Macdonald Bill January 27th, 1890."

Q. 79. Do you find in this bill book No. 3 that you are now considering, records of any blanks shipped to the Columbia Phonogragh Company? 971

A. There appears to be ten of these bills in this bill book, the first reading as follows:

" Order No. 959

ORANGE, N. J. Oct. 21, 1889.

THE NORTH AMERICAN PHONOGRAPH COMPANY
To—EDISON PHONOGRAPH WORKS, DR.

972

Oct. 21—6 Phonographs Style "T" Nos. 4309,
4346, 3986, 3758, 3062, 4371
1 bbl. (150) Phono Blanks--------$11.25
Bbl & packing-------------------- .25

$11.50

Shipped to Columbia Phono. Co.
Washington, D. C."

973

In referring to this bill, I have omitted any unimportant data.

> Copy of bill for material shipped the Columbia Phonograph Company and referred to by the witness and appearing on page 6 of book No. 3 is offered in evidence and marked "Defendant's Exhibit, Columbia Phonograph Company Bill, October 1889."

974

Q. 80. Please examine all the bill books you have produced and put on the record all shipments of blanks to the Columbia Phonograph Company?

A.

	Date	No.		Number	Date			Number
	Feb.	22,	1889	12	Dec.	14,	1891	750
	April	10	"	12	Jan.	4	1892	750
	April	12	"	24	Jan.	12	"	750
975	April	18	"	48	Jan.	23	"	750
	Sept.	9	"	36	Feb.	6	"	1500
	Sept.	10	"	150	Feb.	10	"	300
	Oct.	2	"	150	March	1	"	1500
	Oct.	21	"	150	"	2	"	300
	Oct.	22	"	150	"	9	"	750
	Nov.	14	"	150	"	14	"	300
	Nov.	22	"	150	"	22	"	300
	Nov.	29	"	150	"	22	"	750
	Dec.	5	"	150	April	1	"	750
976	Dec.	11	"	150	"	11	"	300
	Dec.	18	"	150	"	21	"	750
	Dec.	30	"	150	May	13	"	750
	Jan.	21,	1890	150	"	27	"	750
	March	6	"	150	June	1	"	750
	March	7	"	150	July	20	"	450
	March	31	"	150	"	22	"	750
	April	4	"	150	Aug.	16	"	750
	April	16	"	300	"	24	"	750
	April	18	"	150	Sept.	1	"	750
	April	29	"	150	"	15	"	300

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Date	No.	Number	Date		Number	
June	25, 1890	150	Sept.	20, 1892	750	
June	27 "	150	"	20 "	450	
July	2 "	150	Oct.	18 "	150	
"	2 "	150	"	18 "	750	
"	30 "	300	Nov.	12 "	750	
Sept.	10 "	150	Nov.	26 "	750	
"	23 "	300	"	29 "	150	
"	23 "	750	Dec.	14 "	750	
"	23 "	150	Dec.	28 "	750	978
"	25 "	750	Jan.	5 1893	750	
"	26 "	450	"	18 "	750	
"	30 "	150	"	31 "	150	
Oct.	20 "	750	Feb.	2 "	600	
Dec.	2 "	750	Feb.	8 "	600	
Feb.	4, 1891	750	"	8 "	150	
Feb.	25 "	150	"	13 "	750	
March	24 "	450	April	10 "	300	
April	20 "	150	May	2 "	1500	
April	23 "	300	"	2 "	750	979
April	29 "	750	"	25 "	750	
May	8 "	750	June	1 "	750	
May	13 "	1500	"	5 "	1500	
May	26 "	1500	"	21 "	750	
June	19 "	750	July	6 "	300	
July	18 "	750	July	7 "	1500	
July	30 "	750	July	25 "	300	
July	31 "	150	July	26 "	750	
Aug.	13 "	750	Sept.	22 "	750	
Sept.	3 "	750	Oct.	19 "	750	980
Sept.	4 "	750	May	12 1894	750	
Sept.	23 "	300	July	17 "	450	
Sept.	24 "	750	"	20 "	300	
Oct.	6 "	1500	Aug.	11 "	1050	
Oct.	9 "	300				
Nov.	4 "	1500	Total		61982	
Nov.	28 "	750				

The above blanks were shipped to the Columbia Phonograph Company for the account of the North American Phonograph Company. The following

981

blanks were shipped direct to the Columbia Phonograph Company by the Edison Phonograph Works for the account of John R. Hardin, Receiver of the North American Phonograph Company :

Date	Number
Sept. 13, 1894	3000
Oct. 9 "	750
Oct. 17 "	750
982 Oct. 19 "	1500
Nov. 27 "	750
Total	6750

Q. 81. In running over these bills for blanks shipped to the Columbia Phonograph Company, did you find any credit items?

A. The only credit item I found was under date of May 4th, 1893, in which 51 blanks were credited on account of breakage.

983 Q. 82. Do the books of the Edison Phonograph Works, or of the National Phonograph Company, show that any blanks were shipped direct to the Columbia Phonograph Company subsequent to November 27th, 1894?

A. I find a record of two direct shipments made to the Columbia Phonograph Company in February 1897, and produce copies of bills rendered as follows:—

Bill No. 477 of February 23, 1897 for 750 blanks amounting $77.50, and Bill No. 484 of February 26th, 1897 for 5250 blanks, amounting to $542.50. 984

Q. 83. With reference to the large number of bill books which you have produced of the Edison Phonograph Works, kindly ascertain the number of blanks shipped by the Edison Phonograph Works between February 1889 and November 26th 1892 to Thomas A. Edison, to The Edison United Phonograph Company and to the several sub-companies doing business in this country under license from the North American Phonograph Company?

A. The shipments of blanks made during that period were as follows:—

985

For account of

Thomas A. Edison	15,412
Edison United Phono. Co.	7,212
North American Phon. Co.	434,200
Total	456,824

Q. 84. What credits do you find were allowed during this period?

A. To Thos. A. Edison for 5593, to North American
Phonograph Company 3800, making a total of 9393. 986

Q. 85. What, therefore, was the net amount of blanks charged to these concerns during the period mentioned?

A. The total was 447,431 blanks.

Q. 86. Kindly state on the record the net amount of blanks shipped to the same concerns by the Edison Phonograph Works between November 28th 1892 and October 31, 1896?

A. I find that during the period called for by the
question, the net amount of blanks shipped to the 987
various local Phonograph Companies for the account
of the North American Phonograph Company was
320,595. After the failure of the North American
Phonograph Company, these shipments were charged
for the account of John R. Hardin, Receiver, and the
net amount of blanks charged to this account during
the period mentioned was 212,927. During the same
period 59,280 blanks net were shipped either direct to
the Edison United Phonograph Company or to other
concerns for the account of that company. After the 988
National Phonograph Company was formed, the blanks
were charged to the account of that company and
shipped by the National Phonograph Company, and
up to October 31, 1896, the National Phonograph
Company was charged with 158,145 blanks, making a
total of over 750,000 blanks delivered by the Edison
Phonograph Works between November 28th, 1892 and
October 31st, 1896. I have not taken into account the
shipment of blanks to Mr. Edison during the period
called for in the question since this number was very
small and would not exceed 2,000 blanks.

989 Counsel for defendant offers to complainant's counsel for inspection, for the purposes of cross-examination the twenty-eight bill books of the Edison Phonograph Works referred to by the witness in answer to Q. 77.

Defendant's counsel also offers to the inspection of complainant's counsel for the purpose of cross-examination, the several vouchers referred to by the witness in answer to Q. 52,
990 showing the purchase of stearic acid by the Edison Phonograph Works between January 1889 and April 1890, and showing the purchase of stearic acid by the Edison Manufacturing Company between April 1892 and May 1896.

Also, for the same purpose, the large number of vouchers referred to by the witness in answer to Q. 54, showing the purchase of phonograph wax by the Edison Phonograph Works from the Edison Manufacturing Company between May
991 1890 and December 1893.

Also, for the same purpose, the large number of vouchers referred to by the witness in answer to Q. 56, showing the purchase of ceresin by the Edison Phonograph Works between July, 1889, and April, 1890, and the purchase of ceresin by the Edison Manufacturing Company between April, 1892, and May, 1896.

Also, for the same purpose, the vouchers referred to by the witness in answer to Q. 59,
992 showing the purchase of metallic aluminum by the Edison Manufacturing Company between October, 1895, and June, 1896.

Also, the vouchers referred to by the witness in answer to Q. 61, showing the purchase by the Edison Phonograph Works of sal-soda between the months of February, 1889, and May, 1890, and showing the purchases of the same material by the Edison Manufacturing Company between August, 1893, and May, 1896.

Also, for the same purpose, the vouchers

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993 referred to by the witness in answer to Q. 63, showing the purchase of caustic soda by the Edison Phonograph Works in April, June, July and August of 1889, and showing the purchase of the same material by the Edison Manufacturing Company between February, 1893, and July, 1895.

Also, for the same purpose, the several vouchers referred to by the witness in answer to Q. 64, showing the purchase of alum by the 994 Edison Manufacturing Company between April, 1893, and October, 1895.

Also, for the same purpose, the several vouchers referred to by the witness in answer to Q. 66, showing the purchase by the Edison Phonograph Works of acetate of alumina in the months of February, March and April, 1889.

Also, for the same purpose, the vouchers referred to by the witness in answer to Q. 67, showing the purchase of ingredients for phono- 995 graph wax from Mr. Edison by the Edison Manufacturing Company between September, 1889, and April, 1893.

By Mr. Massie: Complainant's counsel now enters timely objection to the various vouchers and bills offered in evidence during the direct examination of the witness, Redfearn, as irrelevant and immaterial; and objects to the entire deposition of this witness upon the same ground and further because based upon said exhibits. 996 Questions 48 and 49 are further objected to as incompetent, the former being hearsay and the answer to the latter being a conclusion of the witness and not a statement of fact. Complainant's counsel declines to cross-examine the witness.

Signature and certificate waived.

Adjourned subject to notice.

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997

CIRCUIT COURT OF THE UNITED STATES

District of New Jersey.

American Graphophone Company, vs. National Phonograph Company.	In Equity, No. 10, March Term 1905.

998

Stipulation.

For the purpose of this case it is stipulated and agreed by and between counsel for the respective parties hereto as follows:

999

(1) Of the several vouchers produced by the witness Redfearn and referred to in answer to question 52, showing the purchase of stearic acid by the Edison Phonograph Works between January 1889 and April 1890, and by the Edison Manufacturing Company between April 1892 and May 1896, proof of any one of said vouchers or its contents shall have the same force and effect as if all of said vouchers were duly and regularly proved, and the introduction as an exhibit of 1000 the voucher and its contents as so proved shall have the same force and effect as the introduction of all of said vouchers as exhibits in this cause:

(2) Of the several vouchers produced by the witness Redfearn and referred to in answer to question 54, showing the purchase of phonograph wax by the Edison Phonograph Works from the Edison Manufacturing Company between May 1890 and December 1893, proof of any one of said vouchers or its contents shall have the same force and effect as if all of said vouch-

1001

ers were duly and regularly proved, and the introduction as an exhibit of the voucher and its contents as so proved shall have the same force and effect as the introduction of all of said vouchers as exhibits in this cause:

(3) Of the several vouchers produced by the witness Redfearn and referred to in answer to question 56, showing the purchase of ceresin by the Edison Phonograph Works between July 1889 and April 1890, and 1002
by the Edison Manufacturing Company beteen April 1892 and May 1896, proof of any one of said vouchers or its contents shall have the same force and effect as if all of said vouchers were duly and regularly proved, and the introduction as an exhibit of the voucher and its contents as so proved shall have the same force and effect as the introduction of all of said vouchers as exhibits in this cause:

(4) Of the several vouchers produced by the witness 1003
Redfearn and referred to in answer to question 59, showing the purchase of metallic aluminum by the Edison Manufacturing Company between October 1895 and June 1896, proof of any one of said vouchers or its contents shall have the same force and effect as if all said vouchers were duly and regularly proved, and the introduction as an exhibit of the voucher and its contents as so proved shall have the same force and effect as the introduction of all of said vouchers as exhibits in this cause: 1004

(5) Of the several vouchers produced by the witness Redfearn and referred to in answer to question 61, showing the purchase of sal-soda or alum by the Edison Phonograph Works between February 1889 snd May 1890, and by the Edison Manufacturing Company between August 1893 and May 1896, proof of any one of said vouchers or its contents shall have the same force and effect as if all of said vouchers were duly and regularly proved, and the introduction as an exhibit of the

1005 voucher and its contents as so proved shall have the same force and effect as the introduction of all of said vouchers as exhibits in this cause:

(6) Of the several vouchers produced by the witness
Redfearn and referred to in answer to question 63,
showing the purchase of caustic soda by the Edison
Phonograph Works between April 1889 and July 1889
and by the Edison Manufacturing Company between
1006 February 1893 and July 1895, proof of any one of said
vouchers or its contents shall have the same force and
effect as if all of said vouchers were duly and regularly
proved, and the introduction as an exhibit of the
voucher and its contents as so proved shall have the
same force and effect as the introduction of all of said
vouchers as exhibits in this cause:

(7) Of the several vouchers produced by the witness
Redfearn and referred to in answer to question 64,
1007 showing the purchase of alum or sal-soda by the Edison
Manufacturing Company between April 1893 and October 1895, proof of any one of said vouchers or its contents shall have the same force and effect as if all of said vouchers were duly and regularly proved, and the introduction as an exhibit of the voucher and its contents as so proved shall have the same force and effect as the introduction of all of said vouchers as exhibits in this cause:

1008 (8) Of the several vouchers produced by the witness Redfearn and referred to in answer to question 66, showing the purchase of acetate of alumina by the Edison Phonograph Works between February 1889 and April 1889, proof of any one of said vouchers or its contents shall have the same force and effect as if all of said vouchers were duly and regularly proved, and the introduction as an exhibit of the voucher and its contents as so proved shall have the same force and effect as the introduction of all of said vouchers as exhibits in this cause:

1009
(9) If John F. Randolph were regularly called and
sworn as a witness for defendant herein, he would
testify that he had charge of the books of Thomas A.
Edison; that he has been employed as a bookkeeper
for Mr. Edison continuously since 1878; that in 1890
a part of Mr. Edison's business was carried on under
the name of Edison Manufacturing Company; that in
1890 he had charge of the books of the Edison Manu-
facturing Company; that he has examined the several
vouchers referred to by the witness Redfearn in answer 1010
to question 54, showing the purchase of phonograph
wax from the Edison Manufacturing Company by the
Edison Phonograph Works in May 1890 and subse-
quent thereto; that all of the bills attached to said
vouchers up to and including voucher No. 1338 for the
month of August 1890 are in his hand-writing; that
the bill attached to said voucher No. 1338 was written
by him on August 11, 1890; that in the preparation of
these bills for phonograph wax it was his practice
to receive from the wax plant at Silver Lake 1011
a written memorandum signed, as he now re-
calls, by James W. Gladstone, showing the ship-
ment of phonograph wax to the Edison Phonograph
Works; that upon receiving each of said memoranda, a
bill for the amount thereof was immediately made out
and forwarded to the Edison Phonograph Works for
payment; that he is familiar with the receiving stamp
of the Edison Phonograph Works, and that the words
"Received Aug. 14, 1890" on said bill of August 11,
1890, were made with said receiving stamp; 1012

(10) If David Hooper were regularly called and sworn as a witness for defendant herein, he would testify that he has been continuously employed by the Edison Manufacturing Company since prior to the year 1893; that during that time he has had charge of the store-room of the Edison Manufacturing Company; that as store-keeper for the Edison Manufacturing Company it always has been one of his duties to see that material charged against the company is actually

1013 received before being paid for; that it is now and always has been the practice of the Edison Manufacturing Company since 1893 to turn over all bills for material purchased by that company to him, in order that the receipt of the materials may be noted on the bills prior to preparing vouchers for and paying the same; that from early in 1893 until June, 1896, the store-room of the Edison Manufacturing Company was located at Silver Lake, New Jersey; that during that 1014 period he was employed in said store-room at Silver Lake, New Jersey; that he has examined the several vouchers referred to by the witness Redfearn in answer to question 52, showing the purchase of stearic acid by the Edison Phonograph Works and by the Edison Manufacturing Company; that substantially all of the bills for this material attached to vouchers from April 1893 to May 1896 were approved by him; that he presents herewith voucher No. 711 of the Edison Manufacturing Company for November, 1895, 1015 to which is attached a bill of R. G. Mitchell & Company, dated October 25th, 1895 for 2146 pounds net of stearic acid; that the initials "D. H." on said bill after the word and abbreviation "Received O. K." are in his hand-writing; that the date "Nov. 27, 1895" is also in his hand-writing; that the said bill was not thus initialed and dated by him until the shipment of stearic acid referred to was actually received by the Edison Manufacturing Company, namely—on November 27th, 1895; that he has examined the several vouchers 1016 showing the purchase of ceresin and referred to by the witness Redfearn in answer to question 56, and finds that the bills attached to substantially all of these vouchers from February 1893 to May 1896 were approved by him; that he presents herewith voucher No. 659 of the Edison Manufacturing Company dated October 31st, 1895, to which is attached a bill of Smith & Nichols dated October 10th, 1895, for 1001 pounds of ceresin; that the initials "D. H." on this bill are in his own hand-writing and are his initials; that the date "10-15-1895" is also in his hand-writing; that

1017
the said bill was not initialed and dated until the material
was actually delivered and was in the storeroom
of the Edison Manufacturing Company, namely—
on October 15th, 1895; that he has examined the several
vouchers referred to by the witness Redfearn in
answer to question 59, showing the purchase of
metallic aluminum, and the bills attached to said
vouchers were approved by him; that he presents
herewith voucher No. 646 of the Edison Manufacturing
Company dated October 31st, 1895, to which are 1018
attached two bills of the Pittsburg Reduction
Company for aluminum bronze powder, dated
October 18th and October 30th, 1895, respectively,
and voucher No. 1312 of the Edison Manufacturing
Company dated June 30th, 1896, to which is attached
bill of the Pittsburgh Reduction Company dated June
2, 1896 for "No. 1 Ingredient" and "No. 16 Sheet";
that the initials "D. H." on all of these bills are in
his own handwriting; that the dates on these bills,
namely "October 19, 1895," "10-30-95" and 1019
"5-2-96" were written by him, that in each case
the said bills were not approved nor dated until the
material represented by the bills was actually received,
the dates of receiving the same being respectively
October 19th, 1895, October 30th, 1895, and May 2nd,
1896; that he has examined the several vouchers referred
to by the witness Redfearn in answer to question
61, and finds that the bills attached to substantially
all of the vouchers after August 1893 were
approved by him, that he presents herewith voucher 1020
No. 640 of the Edison Manufacturing Company dated
October 31st, 1895, to which is attached a bill dated
October 10th, 1895 from the Martin Kalbfleisch Chemical
Company for three barrels of sal-soda; that the
initials "D. H." on this bill are in his hand-writing,
that the date "10-15-1895" is also in his handwriting;
that the bill was not approved and dated by
him as aforesaid, until the material represented by the
bill was actually received by the Edison Manufacturing
Company, namely—on October 15, 1895; that he has

1021 examined the several vouchers referred to by the witness Redfearn in answer to question 63 and finds that substantially all of the bills attached to said vouchers after February 1893 were approved by him; that he presents herewith voucher No. 412 of the Edison Manufacturing Company dated July 1895, to which is attached bill dated July 26th, 1895 from the Welsh, Holme & Clark Company, for one barrel of "Golden Fleece 98% Powdered Caustic Soda"; that
1022 the initials "D. H." on this bill are in his hand-writing, that the date "7-29-1895" is also in his hand-writing; that said bill was not approved and dated by him until the material called for by the same was actually received by the Edison Manufacturing Company, namely —on July 29th, 1895; that he has examined the several vouchers referred to by the witness Redfearn in answer to question 64, showing the purchase of alum, and finds that substantially all of the bills attached to said vouchers after April 1893 were approved by him;
1023 that he presents herewith voucher No. 1365 of the Edison Manufacturing Company for April 1893, to which is attached a bill dated April 4th, 1893 from the Martin Kalbfleisch's Sons Company, for four barrels of lump alum; that the name "Hooper" on said bill is in his hand-writing, that the abbreviation "C. B. S. L." is also in his hand-writing, and means "Chemical Building Silver Lake", to which building the material was sent from the store-room, that being the building where the phonograph wax was manufac-
1024 tured; that the abbreviation "Mfg. wax" is in the hand-writing of James W. Gladstone, the general manager of the Edison Manufacturing Company at that time, this abbreviation indicating that the material was to be used in the manufacture of wax; that it was the practice of the Edison Manufacturing Company at that time and always has been its practice to make out vouchers for bills only after the actual receipt of material, and that the material called for by the bill in question was received by the Edison Manufacturing

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1025 Company and actually in its store-room during the month of April 1893 :

(11) That in connection with all the vouchers referred to by the witness Redfearn in answer to questions 51, 56, 59, 61, 63, 64, and 65, showing the purchase of stearic acid, ceresin, metallic aluminum, sal-soda, caustic soda, and alum, in each case the material referred to in the bills attached to said vouchers was received by the Edison Phonograph Works or Edison 1026 Manufacturing Company as the case may be, during the month represented by the respective vouchers :

(12) That the vouchers referred to by the witness Redfearn in answer to question 66, represent *bona fide* shipments of acetate of aluminum to the Edison Phonograph Works by E. Merck, manufacturing chemists of New York, on the dates, in the amounts, and at the prices stated in the bills attached to said vouchers, and that the material so shipped was in each case re- 1027 ceived by the Edison Phonograph Works on or within a few days of the dates of said bills.

Counsel for Defendant offers in evidence voucher No. 1338 of the Edison Phonograph Works for August, 1890, referred to in the stipulated testimony of John F. Randolph above, and the same is marked "Defendant's Exhibit, Wax Voucher August, 1890"; also, Voucher No. 711 of the Edison Manufacturing Company for No- 1028 vember, 1895, referred to in the stipulated testimony of David Hooper above, and the same is marked "Defendant's Exhibit, Stearic Acid Voucher November, 1895"; also, voucher No. 659 of the Edison Manufacturing Company for October 31st, 1895 referred to in the stipulated testimony of David Hooper, and the same is marked "Defendant's Exhibit, Ceresin Voucher October, 1895"; also, voucher No. 646 of the Edison Manufacturing Company for October

1029 31, 1895 referred to in the stipulated testimony
of David Hooper, and the same is marked
"Defendant's Exhibit, Aluminum Voucher October
1895"; also, voucher No. 1312 of the
Edison Manufacturing Company dated June
30th, 1896 referred to in the stipulated testimony
of David Hooper and the same is marked
"Defendant's Exhibit, Aluminum Voucher June
30th, 1896"; also, voucher No. 640 of the Edison
1030 Manufacturing Company dated October 31st,
1895, referred to in the stipulated testimony of
David Hooper, and the same is marked "Defendant's
Exhibit, Sal-soda Voucher October,
1895"; also, voucher No. 412 of the Edison
Manufacturing Company for July 1895, referred
to in the stipulated testimony of David Hooper,
and the same is marked "Defendant's Exhibit
Caustic Soda Voucher July, 1895"; also,
voucher No. 1365 of the Edison Manufacturing
1031 Company dated April, 1893, referred to in the
stipulated testimony of David Hooper, and the
same is marked "Defendant's Exhibit, Alum
Voucher April, 1893"; also, voucher No. 333 of
the Edison Phonograph Works for March, 1889,
proof of which is admitted above and the same
is marked "Defendant's Exhibit, Acetate Alumina
Voucher March, 1889".

C. A. L. MASSIE
Solicitor for Complainant,
1032 FRANK L. DYER
Solicitor for Defendant.

Dated, March 5, 1906.

1033

ORANGE, N. J., January 22nd, 1906.

Met pursuant to adjournment.

Present:
C. A. L. MASSIE, ESQ., for Complainant,
FRANK L. DYER, ESQ., for Defendant.

Clarence B. Fargo.

CLARENCE B. FARGO, a witness produced on behalf of defendant, having been first duly sworn, in answer to questions proposed by Mr. Dwyer, testifies as follows: 1034

Q. 1. What is your name, age, residence and occupation?

A. Clarence B. Fargo, age—40, residence—891 Noble avenue, Bridgeport, Connecticut, occupation—printer.

Q. 2. Were you ever employed by the American Graphophone Company?

A. Yes, sir. 1035

Q. 3. When did you enter the employ of the Graphophone Company?

A. As near as I can remember, it was in November, 1891.

Q. 4. What was your work at this time?

A. I did the carpenter work, mill-wrighting and pattern-making. I was a kind of handy-man.

Q. 5. How long did you continue at this work?

A. It was sometime in the Spring of 1893.

Q. 6. Did you then leave the Graphophone Company? 1036

A. I was laid off. Everybody was laid off except about five tool-makers.

Q. 7. During the time of your first employment with the Graphophone Company, did that concern make talking machines?

A. Yes.

Q. 8. What type of machine did they make?

A. They made slot machines, and at the last part of my time there they made the commercial machine.

1037 Q. 9. What kind of records were these machines adapted to take?

A. It was a paper tube, coated with wax.

Q. 10. Did you again enter the employ of the Graphophone Company, and if so, when?

A. Yes, it was either the last of December or the first of January, 1893 or 1894.

Q. 11. That is, either in December, 1893, or January, 1894?

1038 A. Yes.

Q. 12. What were your duties when you again returned to the Graphophone Company?

A. I worked at molding records, turning and finishing them up. That was the time Mr. Dodge was foreman.

Q. 13. What was Mr. Dodge foreman of?

A. The Cylinder Department.

Q. 14. Did you assist Mr. Dodge?

A. Yes I did.

1039 Q. 15. What do you mean by the "Cylinder Department"?

A. Two rooms, one the molding room and the other an experimental room where the mixture was made.

Q. 16. What do you mean by "mixture"?

A. Why it was the composition Mr. Dodge made for making the cylinders of.

Q. 17. Were the cylinders which Mr. Dodge made the same kind that the Graphophone Company had formerly made with a paper base, coated with wax?

1040 A. They were not.

Q. 18. What kind of cylinders were they?

A. They were exact representation of the Edison cylinder.

Q. 19. Please describe the Edison cylinder of which you state those made by Mr. Dodge were the exact representation?

A. They were about, I should say, four inches long, and about 2 inches or 2⅛ inches in diameter; they were hollow on the inside, and the hole through them tapered; it was larger at one end than at the other.

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1041 They had a thread on the inside, a sort of a raised thread. I suppose that was to keep them so they would not break easily when put on the mandrel.

Q. 20. About how thick was the shell of these Edison cylinders?

A. On one end, they were, I should judge $\frac{1}{4}$ of an inch thick. On the other $\frac{1}{8}$ or $\frac{3}{16}$ of an inch.

Q. 21. Were these cylinders generally referred to by the employees of the Graphophone Company as Edison cylinders? 1042

Objected to as leading.

A. I don't remember that they were, although they were spoken of as being of the same shape as the Edison blank. I now refer to the blanks that Mr. Dodge made; we did not call those Edison blanks. But the Edison blanks were referred to generally in the factory as "Edison blanks."

Q. 22. Do you know what composition was used by Mr. Dodge in the blanks made by him? 1043

A. I do not know the exact proportions used, but I do know the materials.

Q. 23. What were the materials?

A. Stearic acid, sal-soda, black ozecerite, and sugar of lead, or acetate of lead. At one time, he used a great deal of litharge, or red lead.

Q. 24. Was Mr. Dodge making blanks for commercial use, or was he simply experimenting?

A. He was making them for commercial use. He was also making experiments, I suppose, to better the mixture. 1044

Q. 25. How did the blanks which Mr. Dodge made compare with the Edison blanks?

Objected to as incompetent.

A. They were very similar looking when they were first made, but after they stood for a week or ten days, there was a very heavy blue smoky, cloudy appearance

1045 came over them, and while at the first the record made on them was very good, after they stood a week or ten days and the blue mold began to appear, the records were very scratchy and harsh.

Q. 26. How long did Mr. Dodge continue to manufacture these blanks after you returned to the Graphophone Company?

A. I cannot state positively, but I should say it was late in the Fall of 1894.

1046 Q. 27. During the time that Mr. Dodge was working for the Graphophone Company, did you have anything to do with making the composition for the blanks?

A. I did not.

Q. 28. When Mr. Dodge gave up the manufacture of the blanks, using lead, as described by you, what was then done?

A. Mr. Dodge left and Mr. Macdonald told me to stay and finish up the work, and then a day or two after Mr. Macdonald gave me a formula for making 1047 hard wax cylinders.

Q. 29. Are you a chemist, or had you had any chemical experience up to that time?

A. No.

Q. 30. Do you recall what ingredients were in the formula that Mr. Macdonald gave you after Dodge left?

A. I could not be positive on that, but as I remember it was stearic acid, caustic soda, sugar of lead and black ozocerite.

Q. 31. Who was Mr. Macdonald?

1048 A. He was factory manager for the American Graphophone Company.

Q. 32. Did you attempt to make any experiments with the formula which Mr. Macdonald gave you?

A. Yes.

Q. 33. With what result?

A. Blue mold on the cylinder.

Q. 34. Did Mr. Macdonald assist you in these experiments, and was he present when they were made?

A. He generally came in and gave some suggestions

1049 and left me to work them out and sometimes he would take the matter up himself.

Q. 35. Did Mr. Macdonald ever say to you in effect that he would like to be able to make as good blanks as the Edison blanks?

> Objected to as incompetent, calling for hearsay.

A. I don't remember that he used just those words. 1050

Q. 36. Did Mr. Macdonald in your presence ever refer to the superior quality or character of the Edison blanks?

> Objected to as incompetent, calling for hearsay.

A. He did.

Q. 37. Do you recall what he said concerning the Edison blank?

1051

> Objected to as incompetent, calling for hearsay, and motion to strike out this line of testimony.

A. I do. He remarked on the peculiar sheen and of the fruity smell of the cylinder. He also took a knife and shaved the cylinder and crushed the shaving between his fingers and remarked how smooth it was.

Q. 38. In your experiments did you only use the ingredients that Macdonald had suggested to you, and 1052 particularly the sugar of lead?

A. No, I tried anything that I thought might make a better cylinder and overcome the blue smoke.

Q. 39. Did you ever keep a note book, giving the results of your experiments in connection with these compositions?

A. Yes.

Q. 40. Please produce the same?

A. I produce the note-book.

1053

Q. 41. What was your practice in making entries in this note book?

A. I had a small note book, which I use to make notes in as I made the mixture, noting the results obtained and then I would copy them into a larger book which I had at home, and which I produce. I use to copy them generally Sundays, when I had more time at home. I not only noted the results obtained, but I also noted the formulas of the different experiments.

1054 Q. 42. As I understand it, in reference to those experiments which you made, you noted the same in a separate note book at the time those experiments were made and copied those notes in the note book which you have produced within a few days afterwards. Is this correct?

A. Yes.

Q. 43. About one-third of the way from the front
fly-leaf of this note book, I find a note entitled "Formula For Mixing Hard Wax Cyl," which I will ask you
1055 to put on the record and then state what the note refers to?

Objected to as incompetent, the book being a secondary entry.

A.

"24 lbs. Best Stearine

Brand used was ("AA") from A. C. Beldon & Co. N. Y.

1056 Melt Stearine in porcelain lined kettle Raise to temperature of about 350 deg. F. then add 3 lbs. Caustic Soda.

Add soda slowly stirring vigorously, after soda has thoroughly dissolved, or united with stearine which will take some little time, we have stearic soap.

To this add 12 lbs. Best Black ozokerite (ozokerite boiled at a temperature of about 375 deg. F. for 18 or 20 hours. This is necessary to drive off volatile oils which it contains). Add B O in a melted state, stirring well till thoroughly

1057

> united, then add 3 3 lbs. Acetate (sugar) of Lead. This will cause some foaming for a short time, but will soon settle and become quite free from bubbles. Keep at temp. of about 375 deg. for 5 hours and then filter (about 20 thicknesses of cheesecloth."

As I remember, this is the formula which Mr. Macdonald explained to me, and the one which I experimented with. 1058

Q. 44. What do the letters "B O" referred to in this note refer to?

A. Black ozokcerite.

Q. 45. Following the entry of the formula to which you have just referred, I find references to "I mixt." "D mixt." "Mixt. E," "Mixt. G," "Mixt. H" "Mixt. No. 10," and "No. 15 Mixt." Please indicate briefly what these experiments refer to and quote the first on the record?

A. The first experiment "I Mixt." was as follows: 1059

$$``\,\begin{matrix}\text{Str}\\86\end{matrix} + \begin{matrix}\text{B O}\\22\end{matrix} + \begin{matrix}\text{S cau}\\11\end{matrix} + \begin{matrix}\text{Al}\\21\end{matrix}$$

> Melt str. & B O separately and cook 2 hours, then unite stirring well in and cook 2 hours at a temp. of about 330 deg. F. Was called away and Mixt. was cold for 3 days. Then melt and heat to 330 deg. about and add S cau. slowly (Taking 1 hour to add). S cau. was some that had been exposed to air and had collected 1060 moisture, so was in a liquid state when used, having stood 3 days. After adding S cau. cooked at about 350 deg. for 5 hours, then added Al slowly. (1 hour) Cold over night. Melted next morn and cook at 350 deg. for 4 hours. Mixt accidentally got very hot and came very near burning, I should judge.

These relate to experiments made while I was experimenting on mixtures. These notes relate to the results that I obtained.

1061 Q. 46. Having reference to these particular entries, what does the abbreviation "A1" refer to?

A. I am under the impression that it refers to alum. I know at one time that I used alum but cannot state just the exact time.

Q. 47. How did you come to use alum in your experiment?

A. I got of course to trying everything that I could think of. There was some of this alum laying around in a box, and I just tried it, that was all. 1062

Q. 48. Under the note "Mixt. No. 10," I find the following comments "Mixt. is fine, much like Phono Mixt, but there is a slight trace of Blue (not much) after a week standing." What is meant by the expression "Phono Mixt?"

A. Mixture that the Edison Cylinder was made from.

Q. 49. Under the entry relating to "No. 15 Mixt." I find the following: "Shows up better than any. No blue after about one week, and fracture shows a dull color and not that glassy surface. At the same time, it is very close grain and looks just like the Edison Mixt." What did you refer to in this entry as the "Edison Mixt?" 1063

A. That was the phonograph cylinder. We had Edison blanks and records in the shop, and they were always designated as the Edison blank or the phonograph blank.

Q. 50. Was the mixture used by you using alum considered satisfactory by Mr. Macdonald? 1064

A. I should say not.

Q. 51. Why?

A. He told me he had advertised for a soap chemist to get up a mixture that would be equal to the Edison mixture.

Answer objected to as hearsay and incompetent, and motion to strike out.

Q. 52. Can you tell from this note book when it was that you made the several experiments with alum, as-

1065 suming that the notes from "I Mixt." to "No. 15 Mixt." relate to alum?

A. I was under the impression that it was alum that was used, but it may be possible that it was acetate of lead. The experiments in question appear to have been made between May 23 and September 29th, 1894, these being the extreme dates mentioned in the note book in connection with these experiments.

Q. 53. Following the reference to No. 15 Mixt." I find the following note: "Aluminum acetate used in place of Acetate of Lead for Macdonald Mixt." What does this relate to? 1066

A. It was a white substance and seemed to be porous, full of holes, and Mr. Macdonald said it was acetate of aluminum. The mixture spoke of there, referred to the one he brought back with him from Indiana.

Q. 54. When did Mr. Macdonald go to Indiana, and for what purpose, if you know?

1067

> All but the question of time objected to as incompetent.

A. I can't state just the date he went out there, but as near as I can remember it was in the winter of 1894. He told me that he was going out there to see a soap chemist, who was going to work on a mixture for making cylinders. He was out there I should think about a week, possibly a little longer and sent me at the end of that time a letter, stating that he was sending me a carboy of liquor; also, some candle grease, as he termed it, which was, as I found out afterwards, stearic acid with some paraffine added to it. He gave me directions for going ahead with making the mixture from the stuff sent me, which I did. The result was that a very good mixture, which did not show any trace of the smoky appearance, was obtained. 1068

> **All reference to what Macdonald said and did to the witness objected to as incompetent, with motion to strike out.**

1069 Q. 55. Can you produce the letter that Mr. Macdonald wrote you from Indiana?

A. Here is the letter.

> The letter produced by the witness dated—Evansville, Indiana, February 15th, 1895, on the the letter paper of A. Melzer & Company, is offered in evidence and marked "Defendant's Exhibit, Macdonald Fargo Letter."
>
> 1070 By Mr. Massie: Exhibit objected to as irrelevant and immaterial and as not sufficiently proved. Complainant's Counsel thinks the signature to the letter is the genuine signature of Mr. Macdonald and unless Defendant's counsel is notified to the contrary in time to attempt to prove the genuineness, we admit that the letter is genuine.

Q. 56. Do you recall when Mr. Macdonald suggested 1071 the possibility of using aluminum acetate in place of acetate of lead, as observed in your note book?

A. Yes, it was when he came back from the West; he brought some back with him, as I now recall.

Q. 57. What is the note that immediately follows this reference to aluminum acetate, relate to? Please quote the same on the record and explain it.

> A. "The Stearine is a fine pure white and fracture shows little particles of something that shines like little specks of mica.
>
> 1072 Mr. Macdonald says there is Paraffine added to the Stearine and that it is a Special preparation, but think it is only a fine grade of Stearine used for making candles.
>
> The Caustic soda is powdered and comes in Black Tin Cans. 1st Can had white label with Blue & red Lettering, think it is an imported Soda, but not sure."

This is the candle grease that I have before referred to, which was sent from Chicago by Mr. Macdonald

1073
and was bought, I believe, from Schneider. The caustic soda, I found out later was I think, Fairbanks' 98 per cent and was bought from the Troy Laundry and Machine Company.

Q. 58. Do the entries in this note book between the reference to aluminum acetate and the reference to "Evansville Mixt" relate to experiments made before or after Mr. Macdonald went to Evansville?

A. That I think was after he got back from Evansville and up to the time that Mr. Melzer came on to 1074 Bridgeport; then they changed the aluminum acetate and used aluminum oxide; it was a white powder, looked like sand.

Q. 59. Please quote on the record the formula relating to the "Evansville Mixt" and state what this refers to?

> All references to the book in question are objected to on the ground that the same has not been properly proved. This objection is made 1075 once for all.

A.

> " I think it is made after this formula
> 51 oz. stearic acid (Adamantine Stock)
> 9 oz. Paraffine
> 10-⅝ oz. 37-½ per cent Lye
> ⅞ oz. Aluminum Oxide Precipitate
> E. Merck, Germany, Darnstadt.
>
> Stearic acid is simply the stearine with all 1076 foreign matter expressed, leaving the pure stearic acid which is very hard dry white substance."

Q. 60. When was this note relating to the Evansville Mixt. entered in this book and under what circumstances?

A. It must have been just after Mr. Macdonald got back from Evansville, I should saw two or three weeks after he returned, for he experimented for some little time after he got back and I didn't know what he was

1077 doing any more than what I was able to pick up from watching him. Finally, he evidently got tired of experimenting with this mixture, he then threw it up and left the experimental room. He left his note book on the table where the experiments had been conducted and having a curiosity to know what the mixture was, I looked at the book and found that the mixture was as stated in answer to Q. 59.

Q. 61. As I understand it then, the note in your note
1078 book relating to the Evansville mixture was copied from Mr. Macdonald's note book?

A. Yes it was.

Q. 62. When Mr. Macdonald came back from Evansville, what was done in the way of experimenting on or manufacturing the wax composition?

A. A few experiments were carried on to get the proper quantities and a few large batches were made to test the cylinders and they were found to contain a great deal of crystallization, from which we had a
1079 great deal of trouble. The mixture was made in what we called a maple-sugar kettle over a coal fire and the scratching in the record we thought was owing to the grit and dust in the room, and the cylinders not proving very satisfactory, Mr. Melzer came on to Bridgeport as I understood from Mr. Macdonald for the purpose of improving the mixture and to instruct me in the making of it. As near as I remember, Mr. Melzer was in the factory for about two weeks, after which he returned home and I continued making the mixture.
1080 I found that the same trouble of crystallization was present and that a great many pin holes appeared in the cylinders. This I imagine was caused by using too large proportions of shavings, and broken cylinders. I suggested to Mr. Macdonald that we make a specified number of batches each week and divide up the shavings so that the proportions would be equal for each new batch of wax. This he finally agreed to and after that, we had very little trouble with pin holes.

Adjourned to Tuesday January 23, 1906, at 10 A. M.

1081

TUESDAY, Jan. 23, 1906.

Met pursuant to adjournment,

Present: Counsel as before,

The examination of MR. FARGO is continued.

Q. 63. Have you considered those entries in your note book, relating to experiments from "I. Mixt." to "No. 15 Mixt.", which you say were made between May and September 1894, since yesterday, and is your 1082 recollection as to the probable meaning of the abbreviation "A1" any clearer than it was yesterday?

A. I have carefully thought this matter over during last night, and I believe now that the "A1" referred to in the note book must refer to acetate of lead and not to alum, for the reason that these experiments seemed to be made in series and those containing alum consisted only of one or two small experiments. This term "A1" could not have referred to aluminum, as I knew nothing of aluminum until Mr. Macdonald returned from 1083 Evansville, which was in February 1895. Another reason that leads me to believe that this term refers to acetate of lead is because the quantity used was so large and in the alum experiments the batches were very small, being made in a four-quart agate-iron stew-pan.

Q. 64. Were those entries in your note book which we have so far considered up to, but not including, the reference to aluminum acetate, written down in that book before or after Mr. Macdonald returned from 1084 Evansville?

A. Before, sometime before.

Q. 66. Up to the time that Mr. Macdonald returned from Evansville, what term was used to express the meaning of the principal ingredients in the composition—stearine, or stearic acid?

A. As near as I can remember now, the term—stearine was used.

Q. 66. Please quote on the record the entry in this

1085
note book relating to the manufacture of "37½ per cent lye" and explain the same?

A.

> "37½ per cent Lye. Take 10 Gal. of distilled
> water (water that has condensed from steam, or
> snow melted) and heat up till you can hold
> your hand in it without burning hand. Place
> this water in an earthenware jar or something
> 1086 of the kind and stir in Greenleaf's Soda Caustic
> till the Hydrometer (An instrument for determining
> the density of heavy liquids
> after the old fashioned idea of floating an
> egg in it, and if it was heavy (or dense)
> enough it would float and if not would sink)
> would register 37½ per cent. 1st 10 lb. can
> of S Cau was added and then part of another,
> then tried hydrometer and I think the balance
> of the can was added and part of another at any
> 1087 rate go slow until the hydrometer registers 37½
> per cent, if it is too strong more water can be
> added till it is O. K. I think it wants to stand
> a while before you can get the full strength (A
> few minutes at least) after standing a skin of
> something comes over the top. The Lye should
> be filtered through Filter Paper before using.
> This is as near the way to make 37½ per cent
> Lye, as I can tell now from having helped Mr.
> Macdonald make it and what I have seen of the
> 1088 making."

This record relates to the making of lye as I saw Mr. Macdonald making it, and also assisted him in making it.

Q. 67. Does the reference in this extract to "Snow melted" enable you to fix the time at which the entry in question was made in your note book?

A. Yes, it does. It was shortly after Mr. Macdonald returned from Evansville, when it was cold weather and snow could be secured.

1089

Q. 68. Do I understand that after Mr. Macdonald returned from Evansville in February 1895 that Mr. Melzer came to Bridgeport?

A. Yes.

Q. 69. Do you know when this was?

A. I should say a month and a half, or two months after Mr. Macdonald's return.

Q. 70. Did you assist Mr. Melzer in his work?

A. I did more or less.

Q. 71. What was Mr. Melzer doing when at Bridgeport? 1090

A. Experimenting on the mixture, and he also instructed me on the same. He showed me how to put the mixture together and the proper proportions to use.

Q. 72. Did Mr. Melzer succeed in making a good composition?

A. I consider that he did.

Q. 73. How long did Mr. Melzer stay at Bridgeport?

A. I should say about two weeks, although I would not be certain. 1091

Q. 74. After Mr. Melzer left Bridgeport, what did you do?

A. I immediately took up the work of manufacturing cylinder composition, as Mr. Melzer had explained the same to me.

Q. 75. Did you meet with any difficulties in this work? If so, what were they?

A. The greatest trouble that I had, in fact, the only trouble I had was with pin holes. 1092

Q. 76. What do you mean by pin holes?

A. Small holes that appeared over the surface of the cylinder after the same had been turned off, which appeared like a small bubble.

Q. 77. Did you succeed in overcoming this difficulty?

A. I did. I had an idea that if we made a definite number of batches of new material each week and added the same amount of shavings each time that it might overcome this difficulty. This I suggested to Mr. Macdonald, who later told me that I might try it.

1093 I immediately started making two batches of the new material each week at first and adding always half of the shavings of that week to each batch. This practically did away with the pin holes.

Q. 78. After Mr. Melzer left Bridgeport, did you carry on the manufacture of the wax composition on a large scale?

A. Yes, I made batches for several thousand blanks a day, as I now recollect.

1094 Q. 79. Where were these blanks molded by the American Graphophone Company?

A. They were made in the Molding room of the Cylinder Department, situated in the two story and basement building, located on Cherry Street, and part of the upper floor was used for the assembling room. X

Q. 80. Who had charge of this Molding room?

A. I did.

Q. 81. Do I understand that you not only had charge of making the wax composition, but also, forming it 1095 into blanks?

A. Yes, I had charge of the whole cylinder Department.

Q. 82. When did commercial operations commence at the Graphophone factory in the manufacture of blanks?

A. Soon after Mr. Melzer left for Indiana, with the exception of what was termed the "E" or "Commercial" cylinder, which was made from molding broken Edison blanks, together with broken blanks of the 1096 "blue" mixture made by Mr. Dodge. These were reamed out and paper tubes inserted in the center, the tube being the same tube used on the old style of coated graphophone cylinders. The broken Edison blanks were shipped from out of town in barrels.

Q. 83. Do you recollect when you began to manufacture these "E" or "Commercial" cylinders?

A. I don't remember the exact time, but I am under the impression that it was just previous to Mr. Melzer's visit to Bridgeport.

1097 Q. 84. Referring to your note book, I find a number of entries between that entitled "Evansville Mixt" and the date "July 20th, 1896." Are you able to state when these entries were made in the note book?

A. These entries were made after the Evansville Mixture was known to me and I should judge from my recollection previous to the date of July 20th, 1896.

Q. 85. Have you any definite recollection as to these entries?

A. No, I have not. 1098

Q. 86. When did you leave the employ of the Graphophone Company?

A. It was about four weeks previous to the election of Grover Cleveland, President of the United States, or about the first part of October 1896.

Q. 87. Are you sure that you have correctly stated the name of the Presidential Candidate elected at this time?

A. I made a mistake; I should have said William McKinley, instead of Grover Cleveland. 1099

Q. 88. From the time that you left the employ of the Graphophone Company, did you give any special thought to these wax compositions, or to the work which you had done in that line?

A. I did not, previous to this last summer, when I had a few hours conversation with Mr. Dyer at the Edison Laboratory.

Q. 89. Between the time that you left the Graphophone Company in October 1896, until you saw me last summer, did you have occasion to examine the note book that you have produced? 1100

A. I did not, you remember that I said that I did not know whether I would be able to find it, but did finally find it in the bottom of a trunk, where it had laid for some time.

Q. 90. Reading your note book from the back fly leaf, I find on the first and fourth sheets, notes of what purport to be an "analysis of Edison Cyl." Please put these analyses on the record and state, if pos-

1101 sible, when and how you came to enter them in your note book?

> Objected to as incompetent on the grounds already stated, the note book not having been properly proved, as an original entry. Further objected to as irrelevant and immaterial.

A. The first analysis is as follows :—

1102 " ANALYSIS OF EDISON CYL.

Str. Acid	79.580
Ozokerite	11.790
Resin	0.000
Sodium Oxide Na_2O	4.752
Iron Fe_2O_3	0.020
Manganese Da Mn_2O_3	0.048
Sulphuric Acid SO_3	1.641
Aluminum Oxide Al_2O_3	1.998 "

1103 The second analysis is as follows :—

" ANALYSIS OF EDISON CYL

	Old
Stearic Acid	79.580
Ozokerite	11.790
Resin	0.000
Sodium Oxide Na_2O	4.752
1104 Iron Fe_2O_3	0.020
Manganese Da Mn O_3	0.008
Lead $DaPb^2O$	0.048
Sulphuric Acid SO_3	1.641
Aluminum Oxide Al_2O_3	1.998
	99.837 "

In the case of one of these, it was taken from Mr. Macdonald's note book, spoken of before, shortly after his return from Indiana. In the case of the other one,

1105

I cannot state definitely when it was put in the book. I remember it was stated to me that this analysis was made by Mr. Melzer and remember particularly of Mr. Macdonald speaking in reference to the manganese, which he said might have come from the kettle in which the mixture was cooked, and that the mixture might not have contained any manganese added in that form.

Q. 91. Do you remember which of these analyses it was that you copied from Mr. Macdonald's note-book? 1106

A. I do not.

Q. 92. In this note-book I find an entry in ink, entitled "Mixture made by Stormes, which he says is the Edison mixture." What does this refer to?

A. This refers to the mixture made by Mr. Storms, which he claimed was the Edison mixture.

Q. 93. Who was Mr. Storms?

A. He was a man whom Mr. Macdonald secured, as I understood, through some man in the shop who was acquainted with Mr. Storms in Orange, New Jersey. 1107

> Answer objected to as hearsay and incompetent.

(Witness continues:) I was told he was able to make the Edison mixture, and that he had been hired to come to Bridgeport and enter the employ of the Graphophone Company with that object in view.

> Objection repeated and motion to strike out 1108

Q. 94. Before Mr. Storms came up to Bridgeport, did Mr. Macdonald have any conversation with you concerning him?

> Objection repeated and motion to strike out.

A. Yes; he stated that Mr. Storms was coming to Bridgeport to work for the Graphophone Company, working on this mixture spoken of. I immediately asked him what effect that would have on my position;

314

1109 his answer was that it would have none; that they would find out what this man Storms knew of the mixture, and then they could let him go, or give him a position somewhere in the factory.

Q. 95. When did Storms come to Bridgeport?

A. To the best of my recollection, it was early in September, 1896.

Q. 96. As I understand it, then, you were employed by the Graphophone Company after Storms went up
1110 there?

A. Yes; I was there about a month, as near as I can recollect.

Q. 97. Did Storms, after he came to Bridgeport, do any work with wax compositions?

A. He did, experimenting on this mixture which he claimed was the Edison mixture.

Q. 98. Please put on the record the note in your note-book relating to the so-called "Stormes Mixture."

1111

Objected to as incompetent, the note book not being admissible for the reasons stated.

A.

"Mixture made by Stormes which he says is the Edison Mixture is as follows:

100 lbs. Smith & Nicols Stearic Acid melted in Gas Pot.

1112 15 lbs. City water put into Steam Pot and add 22 lbs. Sal Soda and when dissolved add 1 lb. Greenbank's 98 per cent Caustic Soda (Powdered) then when boiling add a quantity (about 6 inches in diameter (should say 1 lb.) by 1 in. deep) of a powder (Aluminum Bronze Powder bought of the Pittsburgh Reduction Co. of New York, Rooms 10 & 11 Havemeyer Bldg. 26 Cortlandt St. N. Y.)

Powder added slowly. Foamed. After Liquor is done foaming Filter and add to Stearic Acid with out heating up any more than it is after

1113
filtering. Storms says he used to run a steam
pipe into the kettle and mix his liquor that way.
After liquor has done foaming it will stand any
heat almost without foaming again when it is
added to stearine should dip about a half pint
or less in dipper and tip just enough to let
little of stearine flow over into hand dipper
when it will foam violently and liquor should
go in very slowly. After all foaming is done,
add 20 lbs. of white ozokerite (or Sirisene or 1114
ciricine) melted and then cook short time
filter through canvass or drilling and mould.
Smells bad—Good Cyl."

Q. 99. When was this entry which you have just read made in your note book?

A. This entry was made shortly after Mr. Storms
came and some parts of it were made from my own
observations, and as near as I can remember the quan-
tity of stearic acid, etc was given me by Mr. Mac- 1115
donald or Mr. Storms, I am not positive which. I
can't state the exact time at which this entry was
made, but as near as I can remember it was within a
few weeks after Mr. Storms came.

Answer objected to as based on the incompetent notebook and as partly hearsay.

Q. 100. Are you certain that the entry in question
was made before you left the employ of the Grapho- 1116
phone Company?

A. I am.

Q. 101. I notice that in this entry, although you give specific amounts for stearic acid, water, sal-soda, caustic soda and ceresin, you refer to the quantity of aluminum bronze powder as being "six inches in diameter by 1 in. deep". Why did you refer to this ingredient in this way?

A. This was something that I observed. Mr. Storms, while making the mixture one day, left his door open, 1117 I had occasion to pass by and noted that he used such a dish, apparently a scoop from a set of tortion balances, which as near as I can judge was of these dimensions. I was afterwards informed by Mr. Macdonald that the proportion of bronze powder used was 1 lb. to 300 lbs. of stock.

The last sentence objected to as hearsay

1118 Q. 102. Do you find any entry in your notebook confirming the last answer you have made?

A. Yes, on the succeeding page I find the following:—

> "Mr. Macdonald says a quantity of Aluminum Bronze powder is 1 lb. to 300 lbs. of stock."

Answer objected to as hearsay and incompetent.

1119 Q. 103. When was this last entry made in your book?

A. Sometime before I left.

Q. 104. After Mr. Storms came up to Bridgeport what did you do?

A. I continued to manufacture our own blank and was inconvenienced a great deal in this through the actions of Mr. Storms, who constantly interfered with the help, giving orders which conflicted with those already given by myself, and after warning him to desist,
1120 referred the matter to Mr. Macdonald, who gave me no satisfaction and some little time later I gave up the position.

Q. 105. Was there any feeling of rivalry on your part, or jealousy of Mr. Storms for what he was doing?

A. Naturally there was. After working hard for sometime for the Graphophone Company, to have an outsider come in and interfere in that way, feeling as I did that it would effect my position and constantly hearing rumors of what was to be done with me; I was naturally uneasy.

1121

Q. 105. Did Mr. Storms succeed in making a better composition than you had made?

A. I believe that he did make a better composition than I had made up to the time that he came, but after discovering that by adding proper proportions of sulphuric acid the foreign substance which I supposed was in the aluminum, consisting of a gritty mass could be precipitated to the bottom of the kettle, and thereby removed, I overcame this trouble.

Q. 106. Was this after Storms came to Bridgeport? 1122

A. The results were obtained directly after Mr. Storms came to Bridgeport, but I had spoken of it before to Mr. Macdonald, when we still continued to have trouble with the grit in the cylinders, which Mr. Macdonald hoped to remove by putting in a steam plant and lining the rooms with tin, practically making them dust proof, the air being pumped down through pipes standing way above the roof of the building and having an outlet through another pipe. 1123

Q. 107. Did this expedient remove the difficulty?

A. It did not.

Q. 108. Do I understand that up to the time that Mr. Storms came to Bridgeport you had this trouble with grit in the wax?

A. Yes.

Q. 109. Did Mr. Macdonald ever say to you that he considered the mixture made by Storms to be preferable to that made by you?

1124

Objected to as calling for hearsay testimony.

A. He said that the mixture made by me after adding the sulphuric acid was well liked in Washington, but that they seemed in Washington to want to get the Edison cylinder made by Storms.

Q. 110. In making the mixture at the factory of the American Graphophone Company do you recall to what temperature it was the practice to heat the mass.

A. Yes from 320 to 330 degrees F.

1125

Q. 111. Did the Graphophone Company possess facilities for heating the wax to a higher temperature?

A. I think not, not a great deal higher, at least. They had a steam boiler for carrying about 130 lbs. pressure, as I now remember, and understood at the time that the guarantee of the company making this boiler was 145 lbs. pressure. Seldom, if ever, was the pressure allowed to go over 130 lbs.

1126 Answer objected to on the ground that the witness was not qualified, and as hearsay.

The note book referred to by the witness is offered in evidence and marked "Defendant's Exhibit, Fargo Note book."

Exhibit objected to as irrelevant and immaterial, as secondary, and as not being sufficiently proved.

CROSS-EXAMINATION BY MR. MASSIE:

1127

Without waiving the objections already entered.

x-Q. 112. Which will you regard as the front and which the back of the Fargo Note book offered in evidence.

A. The part on which my name appears I consider the front.

x-Q. 113. Is it not a fact that this book shows evidences of certain sheets or leaves having been removed? 1128

A. It certainly does.

x-Q. 114. If you open this book with what you call the front downward, are there not entries made beginning at what you consider the back of the book?

A. Yes, there are. I would like to say by way of explanation that the said Fargo Note book was an old book, belonging to my wife's aunt, and some of these leaves were missing when I received the book. I might also state that I had a few private accounts which I tore out before I gave it to Mr. Dyer.

1129 x-Q. 115. Is it not a fact also that if we begin at the "front" of this book, there are entries on two or three pages, then quite a number of blank pages, then an entry written as if you had begun at the other end of the book and then quite a number of additional blank pages extending altogether about a third of the way through the book before we come to any more entries, the first being "Formula for Mixing Hard Wax Cyl?"

A. Yes, that is the way it appears. 1130

x-Q. 116. Is it not a fact that after the entry on the page dated July 20th, '96, there are some more blank sheets, at least a fourth of the book, followed by some disconnected entries on three or four pages, which apparently do not relate to wax compositions?

A. Yes, that is the case.

x-Q. 117. And after that there follow quite a number of additional blank pages, then only one page containing entries written with the book in the same position and all the rest of the entries are written as 1131 from the back of the book? By "after that" I refer to what appears to be a bill against T. H. Macdonald for $2.50, which was one of the three or four disconnected entries referred to in the last question.

A. Yes, that is so.

x-Q. 118. Was it not the fact that during your direct examination you did not always remember what some of the things in this Fargo Note Book related to or meant, for instance, the abbreviation "A1"?

A. Yes, that is true. 1132

> Complainant's counsel renews the objection to the "Defendant's Exhibit, Fargo Note book" as being inadmissible and incompetent, the same not being properly proved.

x-Q. 119. Did you keep a note book regarding your work as carpenter, millwright and pattern-maker?

A. No.

x-Q. 120. Did you keep a note book relating to

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1133 the work you did while Mr. Dodge was with the Graphophone Company?

A. No.

x-Q. 121. Did you keep a note book relating to your work from the end of July 1896 to the time you left the Graphophone Company?

A. Yes.

x-Q. 122. You refer to entries in "Defendant's Exhibit, Fargo Note Book"?

1134 A. This is not the original note book, but I kept an original note book in the factory.

x-Q. 123. Referring to your answer to Q. 105, what was, or is, the proper proportion of sulphuric acid to add to the formula, in order to remove the trouble?

A. 2 drachms 19½ grains to 11 lbs. of stock.

x-Q. 124. How does that compare with the proportion of sulphuric acid in the "Analysis of Edison Cyl" or either of the two analyses, given in answer to Q. 90?

1135 A. I could not tell you, I have never thought of it. It would be beyond me anyway, I am not a chemist.

x-Q. 125. Are you able to make a calculation?

A. I don't know, I never tried it.

x-Q. 126. How did you come to find out what was the proper proportion of sulphuric acid to employ?

A. I had tried nitric acid, some little time before and a small batch of material contained in a small four-quart stew pan, using this as a point to start from, I added sulphuric acid in a little smaller proportion,
1136 but it was entirely a matter of guess work to a certain extent.

x-Q. 127. Was Mr. Macdonald aware of the fact that you had obtained the entries from his note book set out in your direct examination?

A. I think not.

x-Q. 128. When you left the employ of the Graphophone Company about October 1896, where did you go and what work did you engage in?

A. I was out of work for about five weeks: I finally

1137 went to work at Eaton, Cole & Burnham Company as a pattern-maker, in Bridgeport.

x-Q. 129. Did you see anything further of Mr. Storms after you left the Graphophone Company?

A. Not until this last summer.

x-Q. 130. Do you know how long he remained at the Graphophone Company after you left?

A. I do not.

x-Q. 131. Where did you meet him last summer?

A. At Bridgeport. 1138

x-Q. 132. Did you discuss with him the making of the composition for graphophone blanks, last summer?

A. I did not.

x-Q. 133. Have you a good memory for dates?

A. Not the best in the world.

x-Q. 134. Except for the Defendant Exhibit, Fargo Note book, how would you fix the year in which occurred the events you have testified to?

A. By events which happened in my own private life. 1139

x-Q. 135. Such for instance, as the election of the President of the United States?

A. I remember that I was out of work for four weeks previous to the election of McKinley, being unable to find any employment, and one week after the election of McKinley, I secured a position with the Eaton, Cole & Burnham Company; this naturally impressed it on my memory.

x-Q. 136. During the period beginning before Mr. Macdonald went West, as testified by you, down to 1140 the time of Mr. Storms arrival, what workmen were under your direction in the Cylinder Department?

A. As I remember it there were only two boys there until Mr. Melzer came, one of their names was Nelson, the other Hansen. After we got to manufacturing the blanks the force was increased to twelve men, as near as I can remember. The names I recall now were Harry Dawson, Anton Sodeberg, Frank Hay, Myron Felch, a Frenchman, whose name I can't think

1141 of now; these are all the names that I remember at
this time.

x-Q. 137. As you now remember did those same
(about) twelve men continue in the Cylinder Department
after Storms came and until you left?

A. Yes. I have just thought of another name. A
young man by the name of Neff, I think Charles Neff.

x-Q. 138. Were you aware of what Mr. Melzer was
doing at the Graphophone factory, except in a general
1142 way?

A. No.

x-Q. 139. Do you know what changes Mr. Melzer
made in the formula that Mr. Macdonald gave you
after his visit to the West; or did Mr. Melzer make
any change?

A. I know that there has been a great deal of
acetate of aluminum used, and after Mr. Melzer came
we used the hydrate of aluminum. This is the only
reason I have to judge that any change was made.

1143 x-Q. 140. Please state in your own language the
difference between the formula or composition you
were making when Mr. Storms came and the one that
Mr. Storms employed?

A. In Mr. Storms' mixture, as I understand it,
he used stearic acid; in our mixture stearic acid was
used; in the mixture Mr. Storms made, sal-soda and
some caustic soda was used, in our mixture the caustic
soda alone was used made into a lye; with Mr. Storms'
mixture, aluminum bronze powder was used, in the
1144 graphophone mixture, hydrate of aluminum was used,
being dissolved in a hot lye; in the Storms mixture
ceresin was used, in the graphophone mixture paraffine
was used.

x-Q. 141. Can you recall any other differences between the two?

A. Not in the ingredients, but only in the appearance of the composition I noticed a little difference.

x-Q. 142. What was this slight difference in appearance?

A. The mixture Mr. Storms made seemed to be

1145
more like the Edison blank; that is to say, the cyl-
inders made from this mixture. It had more of a
soft appearance but still was hard, it looked smoother,
as if there would not be so much scratch in it.
When it was broken it looked more like that of the
Edison cylinder in its fracture. The graphaphone cyl-
inders which I made seemed to be more brittle and did
not have the soft smooth appearance that the Storms
blanks had.

x-Q. 143. After you had commenced the use of the 1146
proper portion of sulphuric acid, how did the cylinders
you then obtained compare in appearance with the
Storms cylinders?

A. They appeared to me to be equally as good and
Mr. Macdonald so stated. He said they were just as
good as the ones Storms were making.

x-Q. 144. Did the cylinders you had made with the
proper proportion of sulphuric acid employed develop
the blue mold you have spoken of?

A. No, it did not, up to the time I left. 1147

x-Q. 145. The same question as to the cyliders you
were making before you hit upon the right proportion
of the sulphuric acid?

A. No trouble whatever with the blue mold.

x-Q. 146. What was your object in employing alum,
as stated in your direct examination?

A. I was a at loss to know what to try and having
some of the alum in a box in the Experimental Room,
simply thought I would try it and see what results I
could get. 1148

x-Q. 147. Why was that alum in the experimental
Room; for what other purpose had alum been used in
the Experimental Room, if you know?

A. I don't know.

x-Q. 148. In your direct deposition you have some-
times spoken of "Alumina". What do you mean by
that? Do you mean the same as aluminum?

A. I do not remember having referred to "alumina"
but at the time the acetate of aluminum was experi-

1149 mented with, it was referred to as actate of alumina, as I now recall.

x-Q. 149. Will you please refer to "Defendant's Exhibit, Fargo Note Book" and indicate any passage therein where this substance or its compound are rereferred to otherwise than by the term "aluminum"?

A. I find below the entry which I have quoted in answer to Q. 102 a reference in this note book to "Pure Alumina (Sheet Alu)."

1150 x-Q. 150. Please refer to the same note book and quote the exact term, or abbreviations in which you refer to acetate of lead, or any other lead compound?

A. Under the heading "Formula for Mixing Hard Wax Cylinder Acetate (Sugar) of Lead". On the folling page "1 Mixt", the abbreviation "A1" refers to acetate of lead, and I am now confirmed in this by the fact that this mixture appears directly following "Formula for Mixing Hard Wax Cyl", in which appears "Acetate (Sugar) of Lead". I am satisfied now 1151 that all of these mixtures in which the abbreviation "A1" was used, refer to acetate of lead.

x-Q. 151. Following "No. 15 Mixt" is the note about aluminum acetate and two pages further on is the note on "Evansville Mixt", which speaks of aluminum oxide precipitate. Is it your recollection that aluminum acetate was used first and oxide of aluminum was used later?

A. It is.

x-Q. 152. Was the oxide of aluminum used before 1152 Mr. Melzer came to Bridgeport?

A. I am under the impression that it was, but not by myself, I think Mr. Macdonald knew of this and was using it in some experiments which I believe he made previous to his trip to Evansville.

Adjourned to Monday, January 29th, 1906, at 10.30 A. M.

1153

ORANGE, N. J. Jan. 29, 1906.

Met pursuant to adjournment.

Present: Counsel as before.

Mr. Massie continues his cross-examination of MR. FARGO.

x-Q. 153. Am I correct in understanding that from
the time Mr. Dodge left the Graphophone Company, 1154
down to Mr. Storm's arrival, you were continuously in
charge of compounding the composition for the graphophone cylinders?

A. Practically, I was, although I might state that I was not officially placed in charge of the Cylinder Department for some time after Mr. Dodge got through.

x-Q. 154. And before Mr. Dodge left, you had nothing
to do with these compositions; and after you left
(shortly after Mr. Storm's arrival) you thereafter had
nothing further to do with the mixture? 1155

A. No, I did not.

x-Q. 155. During the period we are now concerned with, between Dodge and Storms, did you take part in *all* the experimental work in connection with producing blanks for the American Graphophone Company?

A. I did not in all of them, but I know that Mr. Macdonald made experiments which I knew nothing about.

x-Q. 156. You had knowledge, had you not, of all the
experiments that were carried on in the two rooms 1156
you were connected with?

A. I did, as a general thing.

x-Q. 157. Did you assist more or less in all of these experiments?

A. I did, if not directly at the time, why later Mr. Macdonald would state the experiments that he had been working on, and asked me to go ahead and try it, which I did.

x-Q. 158. Do you recognize any difference between stearic acid and stearine?

1157

A. The difference, as I know of it, was I think more in the quality of the stuff used; for instance, that which was known to me as stearine, and which was used prior to Mr. Macdonald's return from Indiana, seemed to be softer and was apparently pressed out in sacking or burlap and was in thin flat pieces, while that known as stearic acid was very hard and dry and upon cutting shavings went to a fine dust upon pressure between the fingers. It was also put up in cakes, ap-
1158 parently molded in pans.

x-Q. 159. Do you recognize any distinction between sugar of lead and acetate of lead?

A. I understood they were both the same, I have always known them as the same, since my connection with the cylinder work began.

x-Q. 160. How long after Mr. Dodge left was it that you began to make the "E" or "commercial" cylinders used in broken Edison blanks, together with broken blanks of the "blue" mixture made by Mr.
1159 Dodge?

A. I can't state just how long it was after Mr. Dodge left, but it was sometime previous to Mr. Melzer's appearance, that is, it was just before I heard of Melzer at all, as near as I can remember.

x-Q. 161. The "Formula for Making Hard Wax Cyl" appears to be the first entry in the Fargo notebook relating to this subject. Please state the date you made this entry?

A. I can't state the date that this entry was put in,
1160 but it was copied from the original letter that Mr. Macdonald gave me and was written shortly after Mr. Dodge left.

x-Q. 162. The next entry is headed "I Mixt." When was this entry made?

A. The "D Mixt" was evidently made May 23, 1894, and as I remember it, the other mixtures in this series, were made at about the same time, and the entries thereof in the note book were written in directly after the formulas were made up. The entries being copied from the original notes on the following Sunday

1161 after the notes were made, as I kept this book at my home.

x-Q. 163. The next entry is headed "D Mixt" and "May 23rd '94." Does this indicate that the entry was made in this exhibit note book on May 23d, 1894, or that the mixture was completed on that date?

A. I am quite positive that the entry referred to was the date on which the mixture was made, and not when it was copied in the note book.

x-Q. 164. At the bottom of this same page, there is 1162
a heading "Mixt E." Does this indicate a separate mixture, or is it a part of a previous note?

A. This mixture referred to as "Mixt E" as near as I can recollect, was a certain amount of the "D Mixt" spoken of above, with the addition of the acetate of lead.

x-Q. 165. When were "Mixt G." "Mixt H." and "Mixt 10," which all appear on the same page, facing "Mixt D," made, or when were these entries made?

A. I could not say positively. I have no definite 1163
recollection about these dates.

x-Q. 166. The entry relating to "Mixt 10" seems to continue over on the next page, and on the page facing the latter is the entry beginning "Aluminum acetate". When was this last named entry made, or what was the date of the transaction of which it was supposed to be a copy?

A. I could not give any definite information in regard to that, as near as I can judge this entry in regard to aluminum acetate must have been made after Mr. Mac- 1164
donald's trip to Evansville, as I knew nothing about aluminum previous to that.

x-Q. 167. The entry headed "Mixt E", I understand was copied in this exhibit note-book on a Sunday after the mixture was made; is that correct?

A. That was my habit, and as far as I can remember I do not know that I ever skipped a Sunday. That is, if I had any notes to be copied in.

x-Q. 168. Was this note relating to "Mixt E" copied

1165 in after May 23d; I mean upon the Sunday occurring next after May 23d, or after Sept. 29?

A. I should say that on thinking the matter over that this cylinder was made on May 23d and on Sept. 29 found there was no trace of blue mold.

x-Q. 169. But this entry must have been written into the Exhibit Note book after September 29th, and probably upon the next succeeding Sunday?

A. Yes, to the best of my belief it was.

1166 x-Q. 170. The entry "Mixt 10" refers to a mixture made on Sept. 19th, does it not?

A. I don't know. The mixture was evidently started on the 19th, as the date shows, but on the same page in the same mixture, is the date September 22nd; it may be possible that the mixture was not finished. I might have stopped for some reason on the 19th and started in again on the 22nd, although I am not certain.

x-Q. 171. Does it not appear to you, since the date

1167 Sept. 22nd and certain figures, are enclosed in pencil marks, that the first part of the entry "Mixt 10" was written upon the Sunday next succeeding Sept. 19th and the entry containing the date Sept. 22 was written later, upon the Sunday next succeeding Sept. 22nd?

A. I don't know just what dates Sunday fell on at that time, and therefore could not say.

x-Q. 172. Assuming that these two dates, Sept. 19 and Sept. 22 were in 1894, and that September 19 of

1168 that year fell on Wednesday, and September 22 on the following Saturday, then can you answer the question?

A. In the "Mixt 10" under date of Sept. 19, I judge from the notes that the formula made on the 19th, the figures were in ounces and that later on Sept. 22nd, another batch was made in pounds, using pounds instead of ounces, and assuming that Sept. 22nd fell on Saturday, this entry was probably made on the following Sunday, as that was my custom.

x-Q. 173. It appears to you, then, does it not, that

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1169

the entry "Mixt 10" was made in this note book before you wrote in the entry "Mixt E" which actually precedes it in the note book?

A. That is my impression ?

x-Q. 174. The very next date in the note book that I can find, I mean the next entry containing a date, is July 20th, '96. Am I correct, or can you find some intermediate date?

A. You are correct, I can find no other date.

x-Q. 175. Before resuming the cross-examination 1170
this morning, you read over your deposition as far as
it had then gone, did you not?

A. I did hurriedly.

x-Q. 176. Aside from any clerical errors, or mere verbal changes, is the typewritten transcript correct; or do you wish to make any alterations?

A. I read over the testimony over hurriedly and it seems to be correct.

x-Q. 177. The next to the last dates in the Exhibit
Note book (so far as the same relates to wax compos- 1171
itions) is Sept. 19 and 22, which we have assumed as
being for 1894; and the next date, about a dozen
pages further on is July 20, 1896. Can you tell within
what year any of the intermediate entries were written?

A. The entry relating to "No. 15 Mixt" was made in 1894, the following entries called for in the question were made during 1895.

x-Q. 178. It is not the fact that in the Fargo note
book, beginning with "Formula For Mixing Hard Wax
Cyl", already referred to, and continuing through the 1172
page containing the entries headed July 20th, '96,
there are no blank pages; and the entries follow one
right after the other with the exception here and there
of a few lines of blank paper?

A. That is the case.

x-Q. 179. How do you know that the entries appearing upon the two or three pages prior to the page dated July 20th '96, were written in 1895?

A. For the reason that they contain references to

1173 material, which in some cases I knew nothing about previous to 1895.

x-Q. 180. But how do you know that these particular entries were not written in 1896?

A. Because as I remember, these notes were made at the time the experiments were being made with aluminum; about the time of the Melzer visit.

x-Q. 181. My last two questions relate only to the matter appearing on the two or three pages before the
1174 page containing the date July 20, '96. With that understanding I repeat the two questions?

A. I could not swear to it, but it is my impression the way the notes read. I might say that these notes were made at random, they might have made at one time and then no more made for sometime, as I remember it, I did not take a great many notes at that time. We were looking out for the manufacture more than we were for the experimental end of it. If there was any occasion came up for an experiment, why it was
1175 made. This is as I remember it.

x-Q. 182. Please look at the last page before the one headed July 20, '96, which is on the back of the same sheet. What is there about this page that leads you to think it was written in 1895 and not in 1896?

A. There is only one reason that I can see in these notes to cause me to think that it was not written in 1896. On the page preceding the one referred to, and evidently a part of the same mixture, is the reference "Mixture will foam quite a little, but if fire is made
1176 as hot as possible and water cooked out fast will not raise up very high in pot." As the the coal kettles, otherwise known as "Maple-sugar pots" were not used to my knowledge in 1896, I am satisfied that this mixture was made sometime in 1895, and the entry in the book made at that time.

x-Q. 183. What form of aluminum do you understand Mr. Macdonald brought back from the West with him?

A. I am under the impression at this time that it was the hydrate of aluminum.

RE-DIRECT EXAMINATION BY MR. DYER: 1177

Re-d. Q. 184. Regarding the entry from your note
book, which you have put on the record in answer to
Q. 45, what is the meaning of the abbreviation "Str."?

A. Stearine.

Re-d. Q. 185. What is the meaning of the abbrevia-
tion "B O" or "B o"?

A. Black ozokerite, sometimes called by me "nigger
wax". 1178

Re-x-Q. 186. What is the meaning of the abbrevia-
"S cau"?

A. Soda caustic, or otherwise known as caustic soda.

Re-x-Q. 187. After you began to make the compo-
sition commercially for the Graphophone Company at
Bridgeport, subsequent to Mr. Melzer's visit, and prior
to the time that Mr. Storms appeared, what was the
procedure followed?

A. The stearic acid was put into the mixing pot,
melted and brought up to the proper temperature, 1179
the lye was put into a small steam-jacketed kettle
and brought up to the boiling point, or a little higher,
the aluminum was then added, after this cooked a
short time, it was added slowly to the stearic acid.
This caused a great deal of ebullition, which after a
time subsided, after which the paraffine was added and
the whole gradually raised to about 320 degrees F.
The steam kettles were made with a pipe running
down through the floor, from the mixing room to the
molding kettle, also from the kettle where the stearic 1180
acid was melted, to the mixing room. After the mix-
ture was completed, the plug was drawn from the pipe
in the mixing pot or kettle, and the mixture allowed to
run down through the filter, which was tied on the
end of this pipe, into the molding kettle. The mix-
ture was then ready to mold. I might state in correc-
tion of my first statement that the stearic acid was
put in a steam kettle on the upper floor, or just over
the mixing kettle, and when melted, was drawn down

1181 through a pipe into the mixing kettle, being filtered in its descent.

Re-x-Q. 188. What form of aluminum was used, if you know?

A. Hydrate, or a fine powder, looking something like white sand.

Re-x-Q. 189. Did you know this was the hydrate, or were you told so by some one?

1182 Objected to as hearsay.

A. I was told so by Mr. Macdonald, and I also saw the name written on a paper which had contained some of this powder.

Re-x-Q. 190. Are the entries in your note book, which has been introduced and to which you have referred in your testimony, all in your own handwriting?

A. Yes, they are.

Re-d. Q. 191. In reference to the process described
1183 by you in Re-d. Q. 187, how was the aluminum hydrate used?

A. It was added to the caustic soda.

Re-d. Q. 192. When the aluminum hydrate was added to the caustic soda, what was the result?

A. Violent ebullition for a short time, after which there was a scum appeared on the surface, which I skimmed off.

Re-d. Q. 193. Did the aluminum hydrate dissolve in the caustic soda, or retain its original sand-like form?

1184 A. A clear solution was formed. That is to say that a clear slate color solution resulted.

Re-d. Q. 194. When the aluminum hydrate was added to the caustic soda lye, was the latter hot or cold?

A. It was hot. It was brought up to the boiling point or a little higher.

Re-d. Q. 195. Then, as I understand the process, you first made the solution by adding aluminum hydrate to caustic soda lye, then added this solution to

1185 melted stearic acid and after cooking until foaming had ceased, finally added the paraffine?

A. You understand it correctly.

Re-d. Q. 196. Was this process used continuously from the time of Mr. Melzer's appearance untill you left the factory?

A. It was as far as my work was concerned. The process Mr. Storms made was different.

Re-d. Q. 197. Why do you associate your leaving the factory of the Graphophone Company in October 1186 1896, with McKinley's Election in the succeeding month?

A. Upon leaving the employ of the Graphophone Company, I was unable to find work in my line until one week after McKinley was elected, when I secured a position with the Eaton, Cole & Burnham Company, as I was of the Republican faith, and I considered that it was owing to his election that I was able to secure work.

Re-d. Q. 198. Do you recall whether the letter 1187 which Mr. Macdonald wrote you in Evansville was received by you in the ordinary course of the mails, or not?

A. It was not; it was handed to me by Mr. March. Mr. March handed me the letter and said here is something that Mr. Macdonald sent you, enclosed with a letter to myself.

> It is hereby admitted that unless Defendant's Counsel is notified to the contrary within 1188 ample time to attempt to take proof on the matter, this Macdonald letter already offered in evidence was received by the witness Fargo within a few days after the date appearing on the letter.

Re-d. Q. 199. Can you produce the sheets which you state were torn out of your note book by you before showing the same to me?

1189

A. I do—here are the sheets.

> Sheets produced by the witness are offered to counsel for complainant for the purpose of additional cross-examination.
>
> Complainant's counsel has no curiosity concerning matters not in evidence.

Re-d. Q. 200. Do the additional sheets which you
1190 produce contain anything other than personal references, having no connection whatever with wax compositions?

A. They do not.

Re-d. Q. 201. Have you made further search since our last session for any of your original note books, and if so with what success?

> Objected to because such matters should have formed a part of the direct examination.

1191 A. Yes, I produce three original note books.

Re-d. Q. 202. Where did you find these original note books and under what circumstances?

> The objection is repeated to this entire line of examination.

A. I found at my place of business, 183 John Street,
Bridgeport, Conn. in a drawer of my desk, the two
marked "Memoranda", the third and thicker of the
1192 three bound in black cloth at the back I found in the
pigeon hole of my desk at home.

Re-d. Q. 203. Why is it that you did not produce these original note books before?

A. In the case of the one last mentioned, I had forgotten that I had such a book, it being discovered while looking for additional notes yesterday at home. The two marked "Memoranda", I did not consider you wanted after tearing out the pages, or what I considered the more important pages and sending to you last summer.

1193 Re-d. Q. 204. The note book having black cloth at its back appears to relate to experiments conducted between June 1895 and August 1895. Do you recall what these experiments related to?

A. Experiments for getting rid of pin-holes.

Re-d. Q. 205. Do you recall whether these experiments were made before or after Mr. Melzer came to Bridgeport.

A. I am quite sure they were made after his visit.

Re-d. Q. 206. Kindly read on the record the entry 1194 in this note book under date of August 8th, 1895, and explain the same?

A.

> " Aug. 8th, 95.
>
> Mixt same as usual so far as quantity is concerned. Mixed as follows:—
>
> Stock put on and pushed as fast as possible, 37½ put on same time, and pushed when stock was at 240 to 245 F. Liquor was all mixed and 1195 had been boiling from 15 min. to 30 min.
>
> Mix the two and found the first few dippers inclined to lump up a little, but on stirring all broke up and went in all right, added liq. as fast as possible and after all in took time to wash pail out, when got back lumps (or a cake) had formed on bottom, but on stirring a violent boiling took place and lumps (accompanied with what looked like a thick steam, might have been smoke) arose to the surface and broke up, 1196 boiled as hard as wood fire could make it, stirring with small wooden spatchell (or paddle) till temp got up to 310° F, then added paraffine and raised temp to 348 and cool down. (Mixt. is almost white)."

This is the process we carried on after Mr. Melzer's visit to Bridgeport. The stock referred to is stearic acid, which was melted and heated as quick as possible.

1197
The 37½, meaning the caustic soda lye and aluminum
hydrate mixture, was put in at the same time and
hurried through in the same way. Then, when the
stock, meaning stearic acid, was at 240 to 245° F., this
37½ per cent lye referred to, was all thoroughly mixed,
and had been boiling from 15 minutes to 30 minutes.
The lye was added by the dippers full, and evidently
was added too fast, as it immediately went to the
bottom, and as I termed it, formed a cake on the
1198 bottom of the kettle. Upon stirring which, it broke
up and came to the top accompanied by some smoke, I
believe, caused I suppose by the heat of the fire under
the mass at the bottom of the kettle. The liquor was
added as fast as possible and after all was in, I evi-
dently left it long enough to wash out the pail which
had contained the lye and the aluminum. When I re-
turned to the kettle, the lye had evidently formed a
cake at the bottom of the kettle, which when stirred,
caused a violent boiling and the lumps spoken of be-
1199 fore, came to the top, accompanied by smoke or steam,
after which the mixture by stirring came down to the
proper form. After this I continued stirring with a
small wooden paddle, then raised temperature 310
degrees F., then added the cakes of paraffine and
raised the temperature to 348 degrees, then allowed to
cool down. This process was the usual mode of pro-
cedure up to the time that Mr. Storms came and the
reasons for making these notes were owing to the
peculiar conditions arising on this particular batch or
1200 mixture.

Re-d. Q. 207. When did you make this note quoted on the record ?

A. On August 8th, 1895.

Re-d. Q. 208. Do you recall at this time the actual proportion of ingredients that was used after Mr. Melzer's visit to Bridgeport ?

A. I do not, except that I feel quite sure that the amount of stearic acid used for each batch was about 300 pounds.

1201 Counsel for defendant offers to the inspection of counsel for complainant the note book containing the entry quoted by the witness in answer to Re-d. Q. 206 for the purpose of cross-examination.

Re-d. Q. 209. Having reference to the smaller one of your note books marked "Memoranda." Is this an original note book?

A. Yes sir. 1202

Re-d. Q. 210. Did you keep this book at the factory?

A. Yes sir. You will note the spots on the cover of the book, where the wax spattered on, also, the traces of the wax on the inside pages.

Re-d. Q. 211. I find in this note book on the fifth page from the front a reference which I will ask you to put on the record and explain the same.

A.

> "A days work molding P Cyl. Stopping to heat up them, putting out the gas and allowing to drop down to 300° F. from 338° F. also, allowing for filtering and etc is 1740 P Cyl and 1800 could be done by using a little more speed. Above is an easy comfortable day work. 1203
>
> 2000 Cyl is a days work when we don't have to stop to heat up."

This is simply what I found to be a fair day's work
for molding, and I could not state definitely the date 1204
on which this note was made, or when this day's work
was done. I should say it would be some time in the
neighborhood of October or November, 1895, because
all the other dates in the adjacent pages in this book
are in that period.

Re-d. Q. 212. In this same note book, I find a reference to "Edison Mixt." Kindly quote the same on the record and explain it?

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1205 A.

"Edison Mixt.
100 lb. Schneider Stock.
20 lbs. White Ozo
15 lbs. Water + 22 oz. Sal Soda
About 16 oz. of Caustic Soda Greenbank's 98%
Some powder—don't know what it is. Some
1206 powder of a slate color, there was about 20 oz. or about that of the powder."

As I recollect it, this represents my first observation of the mixture made by Mr. Storms, claimed to be the Edison mixture.

Re-d. Q. 213. When was this entry made in the book?

A. Shortly after Storms came, and before I left.

Re-d. Q. 214. As I understand it, at this time, you 1207 knew that Mr. Storms used a slate colored powder, but did not know what that powder was?

A. That is right.

Re-d. Q. 215. A few pages further on I find another entry in this note book, which I will ask you to quote on the record and explain what it is?

A. The entry is as follows:—

"100 lb. Stearic Acid Melted in one Pot.

1208 15 lbs. Water in steam kettle, add about 22¼ lbs. Sal soda, also + enough Caustic Soda to make up 23 lbs. (about 10 or 12 oz.) Powdered Greenbank's 98% then when boiling add some kind of a powder which was of a slate color and put up in oiled paper or at least the paper was oiled from the powder, if not oiled paper, think there was from 10 to 20 oz. used, after this had boiled a short time, add very slowly to stearic A, take a little in dipper and fill dipper gently with stearic A and look out for foaming. After

1209 all in, add 20 lb. melted White ozokerit or (Ciricine)."

This represents further observations of what Mr. Storms was doing, although I still did not know what the powder used was.

Re-d. Q. 216. When was this note entered in the book?

A. About the time Mr. Storms was making these experiments and about when he came to the Graphophone Company? 1210

Re-d. Q. 217. Was it before you left?

A. Yes.

> Counsel for defendant offers in evidence the small original note book referred to by the witness and the same is marked "Defendant's Exhibit, Fargo Original Note Book No. 1".
>
> Exhibit objected to as irrelevant and immaterial and on the further ground that it is incompetent because no foundation was made for it and the same is insufficiently proved. 1211

Re-d. Q. 218. Do I understand from your answer to Re-d. Q. 203, that you removed any pages from your original note book No. 1 before handing the same to me?

A. I did not take any out of note book No. 1.

Re-d. Q. 219. Having reference to the larger original book marked "Memoranda", did you remove any pages from this note book after you left the employment of the Graphophone Company? 1212

A. I did, I tore them out and sent them to you last Summer.

Re-d. Q. 220. Are these the pages (showing the witness several loose sheets)?

A. They are the pages.

Re-d. Q. 221. I observe that one of these separate sheets is headed "100 lbs. St Acid"; kindly quote the same on the record and explain the same?

1213

A.

> "100 LBS. ST. ACID.
>
> 15 lbs. Aqu in Stearic kettle add 22 ##. S. S.
> and heat slowly so it will not thicken up when all
> dissolved add 1 lb. Greenbanks 98% S cau and
> when this mixt boils add A Brz. (6 in diam x 1
> inch deep, should say 10 oz.) (Mr. Mac says 1
> 1214 to 300 but think he is off). When this is added
> it should be slowly, as it foams a great deal but
> after it is done, it would settle down to a clear
> liquid, which should be carefully filtered
> through a muslin bag on inside and a drilling
> bag on outside. This liquor can be mixed by
> running a steam pipe into the kettle and etc.
> Add this to stear and this must be slowly, then
> when done foaming add white ceresine 20 lbs.
> (12-½ cts.) A W & R Co.) and cook till ready.
>
> 1215 55 lbs. to 300 20 lbs. Powder bought—
> Storms says will last 10 days."

This represents my final knowledge of the Storms' mixture after I found out that he was using bronze powder.

Re-d. Q. 222. Is the note on this separate sheet in your hand-writing?

A. It is.

Re-d. Q. 223. When did you write this down?

1216 A. Before I left the Graphophone Company, I don't know just the date, and after Storms came up.

Re-d. Q. 224. And when did you tear this sheet out of your larger original note book?

A. Last summer.

The separate sheet produced by the witness is offered in evidence and marked " Defendant's Exhibit, Fargo Original Memorandum ". The other loose sheets which the witness states were torn out of the larger original note book,

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1217

as well as what remains of the note book itself are offered to the inspection of complainant's counsel for the purpose of cross-examination.

The exhibit is objected to as irrelevant and immaterial, and as incompetent upon the ground that it has not been sufficiently proved.

Re-d. Q. 225. Having reference to this original memorandum, what does the abbreviation "St Acid" mean? 1218

A. Stearic acid.

Re-d. Q. 226. What does the abbreviation "Aqu", mean?

A. Water.

Re-d. Q. 227. What does the "#" after the figures "22" mean?

A. It means—pounds.

Re-d. Q. 228. What does the abbreviation "S.S." mean?

A. Sal-soda. 1219

Re-d. Q. 229. What does the symbol before the word "Greenbank's" mean?

A. That means pounds also.

Re-d. Q. 230. What does the abbreviation "A Brz" mean?

A. Aluminum bronze, having reference to the powder that was used by Storms, which I understood was aluminum bronze.

Re-d. Q. 231. Who was referred to in this memorandum by the abbreviation "Mr Mac"? 1220

A. Mr. MacDonald.

Re-d. Q. 232. Have you attempted to find any original note books relating to your experiments or work with acetate of lead, and which you state is copied in Defendant's Exhibit, Fargo Note book?

A. I don't remember that I had any note book at that time, but copied them from the original notes made on slips of paper. These were afterwards destroyed. I did not think that I would have any further use for them.

1221 Re-d. Q. 233. Can you produce the original memorandum which Mr. Macdonald gave you, describing the acetate of lead composition after Mr. Dodge left?

A. I can and here it is.

Re-d. Q. 234. Was the substance of this original memorandum entered by you in Defendant's Exhibit, Fargo Note-book?

A. Yes, the substance of this appears in answer to Q. 43, although the exact words are not used.

1222 Re-d. Q. 235. Did Mr. Macdonald hand you this memorandum himself?

A. He did.

Re-d. Q. 236. Has it been in your possession continuously ever since?

A. Yes.

Re-d. Q. 237. When did Mr. Macdonald give you this memorandum?

A. Long before Mr. Macdonald went to Evansville.

1223 The paper produced by the witness is offered in evidence and marked "Defendant's Exhibit, Macdonald Memorandum".

Exhibit objected to as irrelevant and immaterial.

Re-d. Q. 238. Mr. Massie has called attention to the fact that in entering your notes in Defendant's Exhibit, Fargo Note Book, you apparently observed no particular order of sequence. Is this the case with the other 1224 note books, some of which you state are originals, which you have produced today?

A. I never have had any particular system of anything of this kind. I am just as liable to open the book and make a note on one page and later open at another page and make a note the other way of the book. I would also state that at the time a good many of these notes were made, especially in the original book, that I had more work than I could attend to, and it was a wonder to me that I had been able to make any notes at all.

1225

Re-d. Q. 239. How much time did you spend in reading over your testimony this morning before Mr. Massie came?

A. Not more than two or three minutes.

Re-d. Q. 240. And how much time did you spend in reading this testimony before the examination was resumed?

A. Probably about five minutes.

Re-d. Q. 241. You stated in answer to one of Mr. Massie's questions that you saw Mr. Storms last summer. 1226 What was the extent of your conversation with Mr. Storms if you had any, and what did you talk about, if you remember?

A. He stopped me on my way to work shortly before one o'clock, and as I would be late at the shop I could not spend very much time with him; I should judge not over five minutes. He asked me if I would go down to the Edison Laboratory, if I should be sent for, as there was some law suit on between the Graphophone Company and the Edison Company, and they 1227 might want my testimony. I told him that I would.

Re-d. Q. 242. You have referred in your testimony to the fruity smell, which the Edison cylinders had in the early days, when Mr. Dodge was working on the mixture possessed. I call your attention to what purports to be a phonograph blank, ask you to smell the same, and state whether this is the characteristic odor that you refer to?

A. It is decidedly.

1228

> The blank referred to is Defendant's Exhibit, Modern Blank.
>
> Question and answer objected to on the ground that the witness is not qualified as an olfactory expert.

Re-d. Q. 243. Do you recall the appearance of the material brought back by Mr. Macdonald from Evansville?

1229

A. Mr. Macdonald brought back a solution, which I understood was a solution of alumina of some sort. A little later, I understood that this solution was made of a hydrate of alumina.

This answer objected to as hearsay and incompetent.

RE-CROSS-EXAMINATION BY MR. MASSIE.

1230

Re-x. Q. 244. Were you instructed by the American Graphophone Company to keep these various note books that have been produced during your various examinations? I mean, was it a part of their instructions to you that you should make entries, such as you have read out in your testimony?

A. Mr. Macdonald said about the first of my making experiments with this material, that it would be well to make notes for reference in future experiments.
1231 This is all that I have any recollection of.

Re-x-Q. 245. Which of these note books or entries that you have produced during your examination, did you show to Mr. Macdonald or to any other representative of the Graphophone Company?

A. I don't know that I showed them to any of them specially, but if a question came up on any formula made, the book in which that formula was entered was referred to.

Re-x-Q. 246. In your re-direct examination (Re-d. Q.
1232 187) you described the procedure followed subsequent to Melzer's visit and prior to Storms' arrival. Wherein did this procedure differ from the procedure followed before Melzer came to the factory?

A. Previous to Mr. Melzer's visit, I had no knowledge of mixtures made with aluminum, with the exception of the mixture made from the liquor sent by Mr. Macdonald from Evansville. In using this liquor I simply melted the stearic acid or candle grease, as it was called, and added the liquor to it. In this mixture

1233 the paraffine, I found out later, had already been added to the stearic acid.

Re-x-Q. 247. Is it your testimony that with the exception of the blanks made by means of this "liquor" you were making no blanks for the Graphophone Company during the period before Melzer's arrival?

A. I don't remember positively, but I am under the impression that if I did so, that it was made from this same liquor, or something similar, furnished by Mr. Macdonald? 1234

Re-x-Q. 248. You did not mean to be understood as testifying that Mr. Macdonald had actually brought along with him any liquor when he came from the West?

A. No I did not, he sent it on ahead, as I was led to believe, so that we could get at the work, and not have to wait until he got home.

Re-x-Q. 249. You have spoken of composition that you made with this liquor. What I am asking is, did you make any other cylinder composition for the 1235 Graphophone Company during the period before Melzer came to the factory?

A. Yes, I made the "E" cylinders with the melted broken Edison cylinders and also the "blue" mixture added together.

Re-x-Q. 250. With regard to the note books produced during your re-direct examination, have you an independent recollection of the matters therein set forth or do you rely upon the note books themselves?

A. I should say that I would have to depend 1236 a great deal on the note books, with the exception of some things that might have been called to my memory through some incident that happened, such as the visit of Mr. Storms to the factory or Mr. Macdonald's visit to Evansville. I have not thought of these matters for many years until recently.

Re-d. Q. 251. Referring to the entry read in your answer to Re-d. Q. 206 have you any independent recollection of this matter either of the substance or the date.

1237

A. Yes, I remember this occurrence and recall just how the lumps came up from the bottom of the kettle. The date I would not remember, except that I know that it was sometime previous to Storms' arrival.

Re-d. Q. 252. In that particular note book in which this entry in answer to Re d. Q. 206 appeared, with the exception of that entry, which is in ink, the other entries are principally short notes in pencil, are they not?

1238 A. Some of them are short, being notes taken on weight of a certain number of cylinders, etc., others however, are longer than the one referred to. The one spoken of is in ink and the others are in lead pencil.

Re-d. Q. 253. Would you be certain in any case that because one of your entries was found in a book containing other entries of a certain date, that the first named entry must have been made about the same period? Would your custom in making notes satisfy your mind that this must be true?

1239 A. I should say yes, although sometimes in the case of for instance stock coming in, I might turn over one or two leaves and enter the stock, skipping those pages when I reached them with the experiments.

Re-d. Q. 254. In Re-d. Qs 212, 215, and 221, you read into the record entries which you say relate to your observations of the Storms' mixture. How did you obtain the information set out in these entries?

A. Through observation and through information given by Mr. Storms and Mr. Macdonald.

1240

The re-direct answers and questions referred to are objected to as hearsay and incompetent.

Re-d. Q. 255. Please look at Defendant's Exhibit, Fargo Original Memorandum and state whether the same contains any writing put on there since you first wrote the main body of the same?

A. I believe that the words "100 lbs." were written in directly after tearing off the sheet from the books.

1241 Re-d. Q. 256. Do you remember doing this yourself?

A. No, I do not; but this is my hand-writing.

Re-d. Q. 257. This Fargo Memorandum has its upper left hand corner torn off and "100 lbs." is written diagonally just below this tear, is it not?

A. It is.

Re-d. Q. 258. What do you know of the entries on the back of this original memorandum?

A. I only remember at one time we made a few ex- 1242
periments, using kerosene oil, and one of these entries is evidently the proportions used in making these experiments.

Re-d. Q. 259. When was it that you made the experiments with kerosene oil?

A. Sometime during 1895; this is the only time that I remember making experiments with kerosene oil. I find upon referring to the note book with the black binding that these experiments were made sometime
in June 1895. 1243

Re-d. Q. 260. The note book you refer to to obtain the date for the kerosene experiments is not the note book from which the Fargo Original Memorandum has been torn?

A. No, it is not.

Signature and certificate waived.

Adjourned to meet Thursday morning, February 1st, 1906, at 10.30 A. M.

1244

1245

ORANGE, N. J. January 24, 1906.

Met pursuant to agreement.

Present: C. A. L. MASSIE, ESQ., for Complainant, FRANK L. DYER, ESQ., for Defendant.

Theodore Von der Lippe.

1246 THEODORE VON DER LIPP, a witness produced on behalf of defendant, having been first duly sworn, in answer to questions proposed by Mr. Dyer, testifies as follows :—

DIRECT EXAMINATION BY MR. DYER :

Q 1. Give your name, age, residence and occupation?

A. Theodore Von der Lippe, age 44 years, residence —Sparrowburg, Orange County, N. Y., occupation— farmer. 1247

Q. 2. Did you ever work for the American Graphophone Company at Bridgeport, Conn.?

A. Yes sir.

Q. 3. What work did you do for the Graphophone Company?

A. Making sapphire points and shaving knifes?

Q. 4. When did you enter the employ of the Graphophone Company?

A. September 10th, 1895.

1248 Q. 5. When did you leave the employ of the Graphophone Company?

A. I left there December 22nd, 1897.

Q. 6. Do you know a man named Frank A. Storms?

A. Yes, sir.

Q. 7. How long have you known him?

A. About 11 years.

Q. 8. Did you know him before you began to work for the Graphophone Company?

A. Yes, sir.

Q. 9. Where had you previously known him?

A. At the Edison Phonograph Works?

Q. 10. Were you ever employed by the Edison Phonograph Works? 1249

A. Yes, sir, I worked with them before going to Bridgeport.

Q. 11. During the time that you were working with the Graphophone Company, did Mr. Storms write you?

A. Yes, sir.

Q. 12. Can you produce Mr. Storms' letter?

A. No, sir.

Q. 13. What became of Mr. Storms' letter? 1250

A. I destroyed it I suppose.

Q. 14. Did you make a search for this letter?

A. I searched high and low for it.

Q. 15. Do you recall the general substance of the letter which Mr. Storms wrote you?

A. Yes, sir?

Q. 16. Please state what it was?

> Objected to as incompetent, being hearsay, and as irrelevant and immaterial. 1251

A. He asked me to speak to Mr. Macdonald and see if he could give him employment in the Graphophone Works?

Q. 17. Did you see Mr. Macdonald?

A. Yes, sir.

Q. 18. What did you say to him?

A. I told him that Mr. Storms worked in the wax room at the Edison Company and was looking for a job for that business. 1252

Q. 19. What did Mr. Macdonald say?

> Objection repeated.

A. He asked me what Storms could do at the wax business, and I told him I did not know what he could do at the wax business. Mr. Macdonald asked me to send for Mr. Storms to come up to see him. I did so, and Mr. Storms came up and Mr. Macdonald spoke to Mr. Storms when I introduced Mr.

1253 Storms to him, but I don't recall the conversation which took place between them.

Q. 20. Was Mr. Storms employed by the Graphophone Company?

A. He began to work in the Wax Room right away and I saw him very frequently from time to time.

Q. 21. Do you know who had charge of the Wax Room at the Graphophone factory before Storms came up?

1254 A. I don't remember the man's name.

Q. 22. Do you remember his general appearance?

A. Yes, a short, thin man with light hair.

Q. 23. Was his name Fargo?

A. Yes, sir.

Complainant's counsel objects to the entire deposition as irrelevant and immaterial and cross-examines *de bene esse.*

1255 CROSS-EXAMINATION BY MR. MASSIE:

x-Q. 24. Where were you employed immediately before entering the employ of the Graphophone Co.?

A. The Edison Phonograph Company.

x-Q. 25. Was it the Edison Phonograph Company or Edison Phonograph Works?

A. Edison Phonograph Works.

x-Q. 26. Why did you just now say Edison Phonograph Company instead Edison Phonograph Works?

A. Merely a slip of the tongue, that's all.

1256 x-Q. 27. How long were you employed by the Edison Phonograph Works?

A. 7 years.

x-Q. 28. What was your occupation while with that concern?

A. Making sapphire points and shaving knives.

x-Q. 30. Please relate the circumstances under which you left the employ of the Edison Phonograph Works?

A. They wanted to cut me down and I would not stand for it.

1257

x-Q. 31. Did you secure work immediately with the Graphophone Company ?

A. Yes, sir.

x-Q. 32. How, through whom, if any one ?

A. Mr. George F. Ballou.

x-Q. 33. Who was he and how did he assist you in obtaining employment with the Graphophone Company ?

A. Mr. George F. Ballou was former superintendent of the Edison Phonograph Works ; I met him in New 1258 York at his office, he told me that they wanted a man at the American Graphophone Works who could make sapphire points, he telegraphed the Graphophone people saying he had such a man, and received answer that he should send me up. Therefore, I went up the following day.

x-Q. 34. During the time you were with the Graphophone Company, did you have any duties except the making of sapphire points and shaving knives ?

A. No sir. 1259

x-Q. 35. Were you the only one engaged in this work when you were with the Graphophone Company ; or were there other workmen doing similar work ?

A. Only under my employment.

x-Q. 36. Please name them ?

A. Adolph Globel, George Speir, Peter Von der Lippe. That is all I recall now from memory.

x-Q. 37. How did you come to leave the American Graphophone Company ?

A. Mr. Macdonald came to me at nine o'clock at 1260 night, and told me that he had to reduce the price for making the sapphire points. I asked Mr. Macdonald how much he wanted me to reduce the price, and he said it would have to be reduced at least one-half. I told Mr. Macdonald, he would have to get somebody else to do the work. I left the shop immediately after.

x-Q. 38. Where was this interview with Mr. Macdonald—in the shop ?

A. In the shop—yes sir.

1261 x-Q. 39. Did you see much of Mr. Storms while you were working for the Graphophone Company?

A. I saw him every day.

x-Q. 40. What part of the premises was your work room?

A. Right under the offices.

x-Q. 41. Have you been back to Bridgeport since 1897?

A. No sir.

1262 x-Q. 42. At which end of the building was your shop?

A. At the end opposite the railroad track there was a wing, and my place was in the basement of that wing.

x-Q. 42. Where was Mr. Storms working?

A. At the same end of the main Building, there was a wing that ran off along the street between the two buildings, and he was mid-way between the two buildings.

1263 x-Q. 43. Was that a one-story wing that Mr. Storms was in, if not, on what floor was Mr. Storms?

A. He was on the first floor, if I recollect rightly.

x-Q, 44. Was the wing that Mr. Storms worked in the same wing that you were in, or were there two wings?

A. There were two wings.

x-Q. 45. Did you know a man working up there by the name of Fargo?

A. Yes sir.

1264 x-Q. 46. Did you ever have occasion to go into the room where Mr. Storms was working?

A. Yes sir.

x-Q. 47. Do you know what he was doing, except in a general way that he was working in the wax room?

A. No sir.

x-Q. 48. Were you still working for the Graphophone Company when Mr. Storms left, or did he leave first.

A. No I was not working there when he quit.

RE-DIRECT EXAMINATION BY MR. DYER: 1265

Re-d. Q. 49. When you left the Graphophone Company were you paid the money that that the company owed you?

A. Not as promised.

Re-d. Q. 50. Did you ever get this money?

A. I had to sue for it.

RE-CROSS-EXAMINATION BY MR. MASSIE: 1266

Re-x-Q. 51. In what court was the suit brought and what was the amount of the judgment?

A. The case never went to court; he offered to settle before it went to court.

Re-x-Q. 52. What was the amount of your claim and what did they settle for?

A. Just for the amount they owed me. The amount was somewhat over $600.

Re-x-Q. 53. Why, upon what pretext, had they refused to pay you this? 1267

A. They offered to settle at a reduced price and I would not accept it and put the matter in the hands of my lawyers at Bridgeport. He wanted to reduce the price on work that he owed me for.

Re-x-Q. 54. What excuse did he, whoever he was, give for wanting to reduce the price?

A. I don't know.

Re-x-Q. 55. Did you feel grateful to the Graphophone Company when the money was paid? 1268

A. I was glad to get the money but had nothing to be thankful for.

RE-DIRECT EXAMINATION BY MR. DYER:

Re-d. Q. 56. Were you working for the Graphophone Company under contract?

A. Yes sir.

Signature and certificate waived.

1269

ORANGE, N. J. Feb. 5, 1906.

Met pursuant to agreement,

Present : R. L. SCOTT, ESQ., for Complainant, FRANK L. DYER, ESQ., for Defendant.

Eben G. Dodge.

1270 EBEN G. DODGE, a witness produced on behalf of defendant, having been first duly sworn, on oath testifies as follows, in answer to questions proposed by Mr. Dyer :

Q. 1. What is your name, age, residence and occupation ?

A. Eben G. Dodge, 39 years old, Maplewood, New Jersey ; Vice-President and General Manager of the Battery Supplies Company, of Newark, New Jersey.

Q. 2. Were you ever employed by the Edison Pho-
1271 nograph Works, and if so, when did you enter the
employ of that concern and in what capacity ?

A. I was first employed by the Edison Phonograph Works in August 1890 as an assembler of phonographs. I was employed by the Edison Phonograph Works in August and remained until November of the same year.

Q. 3. Did the Edison Phonograph Works at that time do an extensive business in phonographs ?

A. Yes, quite a number of machines were manu-
1272 factured.

Q. 4. Do you recall the character of phonograph blanks as made at that time, that is to say, the physical characteristics of the same ?

A. The blanks were not uniform in color, some were of a light whitish fawn color, others were dark, almost of a chocolate hue. They had the same appearance as the blanks of the present date.

Q. 5. When did you leave the employ of the Phonograph Works for the first time, and what did you then do ?

1273

A. I left the employ of the Phonograph Works during the latter part of November, 1890, and was subsequently employed by the New York Phonograph Company about the first of January 1891. My first position with the New York Phonograph Company was that of an inspector or repair man. I held this position about four or five months, and then was made superintendent of the Company, which position I held until November, 1892, when I was employed
by the American Graphophone Company, as a 1274
salesman, having allotted to me the District of Columbia as my territory.

Q. 6. When you were employed by the New York Phonograph Company, did that concern make use of phonographs and phonograph blanks, and if so, for what purpose were they used and to what extent, if you are able to state?

A. Yes, the New York Phonograph Company rented a number of phonographs, both for commercial and
amusement purposes, but it would be impossible for 1275
me to give an idea of the number of machines that were used.

Q. 7. How long did you continue to represent the American Graphophone Company as salesman for the District of Columbia?

A. About one month.

Q. 8. What did you then do?

A. I was sent to the factory at Bridgeport to do some experimental work on diaphragms.

Q. 9. How long did you continue these experiments? 1276

A. Three or four weeks.

Q. 10. Regarding the dates to which you have testified in the preceding answers, do you wish to be understood as stating them positively, or only approximately?

A. I do not believe that the dates given are more than a month out of the way.

Q. 11. After you concluded your experiments on diaphragms for the American Graphophone Company of Bridgeport, what did you then do?

1277

A. I opened up an office for the American Graphophone Company in New York for the sale of graphophones.

Q. 12. What was the character of blanks made by the Graphophone Company at that time?

A. They were known in the business as being ozokerite blanks. They were paper tubes coated with a mixture of ozokerite and paraffine.

Q. 13. How did they compare in proportions with
1278 the Edison blanks?

A. The dimensions of the graphophone blanks, I think, were six inches long by about $1\frac{1}{4}$ in diameter. The paper tube was probably about a thirty-second of an inch thick and had a coating of about ten one-thousandths of an inch of wax. The Edison blanks were about $4\frac{1}{2}$ inches long and about $2\frac{3}{8}$ inches in diameter, the walls being about $\frac{1}{4}$ of an inch thick.

Q. 14. How long did you continue in connection with the office for the Graphophone Company, referred
1279 to in question 11?

A. Until the following Spring, I think sometime during April, 1893.

Q. 15. What did you then do?

A. I was then requested by the General Manager of the American Graphophone Company to go to Bridgeport and make a quantity of ozokerite blanks, which were to be used for musical records to be exhibited at the World's Fair in Chicago.

Q. 16. Who was the General Manager of the Gra-
1208 phophone Company at that time?

A. Charles Flint.

Q. 17. Did you make these ozokerite blanks for the Chicago Fair?

A. Yes, a number of these blanks were made under my supervision.

Q. 18. Was Mr. Thomas H. Macdonald connected with the American Graphophone Company at that time?

A. Yes.

Q. 19. Do you know in what capacity?

1281

A. Factory superintendent, I believe.

Q. 20. After you made the batch of ozokerite blanks for the World's Fair, what did you then do?

A. I started experiments under Mr. Macdonald's supervision on a metallic soap blank, similar to the Edison blank, our object being to produce a blank like the Edison blank.

Q. 21. What was the reason for your trying to produce a blank like the Edison blank?

1282 A. It was recognized by Mr. Macdonald, in fact, every one who had any knowledge of the talking machine business, that the success of the phonograph was due very largely to the blank they used.

Q. 22. Prior to these experiments had you acquired any knowledge of the composition of the Edison blanks?

A. No, except it was generally understood that the blank was a metallic soap with a small quantity of ceresin.

1283 Q. 23. When you were employed by the Edison Phonograph Works, did you have any opportunity of ascertaining the composition of the Edison blanks, or the method of making the same?

A. I can't say that I had.

Q. 24. Do you know whether the Edison blanks at the time you were connected with the Phonograph Works were made openly, for example, like the phonograph, or were they made secretly? I have reference to the composition, and not the molding operations. 1284

A. The composition was made by a secret process and I believe it was made at Silver Lake.

Q. 25. Did you carry on experiments at Bridgeport for the Graphophone Company in the attempt to make blanks like the Edison blanks?

A. Yes.

Q. 26. Prior to that time, had you any chemical experience?

A. None whatever.

1285

Q. 27. Had you had any experience in the manufacture of compositions for phonograph blanks ?

A. No.

Q. 28. Before commencing your experiments, did you attempt to familiarize yourself as to the manufacture of metallic soap, and if so, how far did your preliminary preparation go ?

A. After Mr. Macdonald had outlined to me his experience in endeavoring to make metallic soap blanks 1286 I endeavored to gain as much knowledge as I could of the method employed in making soaps and the addition of the metal to saponified stearic acid. I looked up these matters in all of the encyclopedias and any books that I could secure on the subject.

Q. 29. Can you state the substance of Mr. Macdonald's conversation with you in outlining the results of his experience, and particularly as to his success or non-success up to that time ?

A. My recollection is that the experiments made by 1287 Mr. Macdonald were not satisfactory and most of them were made with castile soap and an addition of litharge. This mixture melted at a very high temperature and was very difficult to mold. He had also attempted to make a mixture of stearic acid, saponified with caustic soda, to which was added a small quantity of litharge. His attempts were not a success and we experimented jointly in endeavoring to secure material like the Edison blanks. In order to familiarize ourselves with the nature of the latter material, we secured several 1288 barrels of broken Edison blanks and studied the conditions under different temperatures, the composition in the melted state and its appearance when it began to harden or congeal.

Q. 30. Did Mr. Macdonald tell you why he made use of litharge in these experiments ? Did he state that the Edison blanks made use of litharge ?

A. I can't say that he did say positively that litharge was used in the Edison blanks, but it was his opinion that a little was used and he had found that litharge and stearic acid would mix very readily.

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Q. 31. In what direction did your joint experiments extend in your efforts to make a composition similar to that of the Edison blanks ?

A. We found that by adding more caustic soda to a given quantity of stearic acid that it would raise the melting point of the composition. We consequently endeavored to gauge the quantity of caustic soda in order to get the same melting point, or congealing point as the Edison composition had. After this was determined, we then varied the addition of the litharge, 1290 in order to get as near as possible the same mixture as the Edison blank. I used in my experiments a certain quantity of stearic acid, saponified or partly saponified, and then added to that various quantities of litharge, but apparently I was using too much litharge and during my absence from the factory, Mr. Macdonald decreased the quantity of litharge and secured a mixture which nearly resembled the Edison blank. About this time, Mr. Macdonald had been in communication with a Mr. English, at least he so stated to me, 1291 X who had been a superintendent of the Edison Phonograph Works, and at Mr. Macdonald's request, Mr. English submitted samples of a composition which he thought would make a satisfactory blank. This material melted at a very high temperature which made it very difficult to mold and had decidedly an acid odor. This suggested the use of acetate of lead, which we used in our experiments, and my impression is that the composition referred to as being more like the Edison blank (I refer to the composition that Mr. Macdonald 1292 made while I was away from the factory) was made with acetate of lead. I varied the proportions of the mixture and used litharge with a very small portion of acetate of lead, thinking that I secured a better mixture. The blanks made by me at this time resembled the Edison blanks, except they were not quite as smooth, or it was impossible to get as smooth a surface as on an Edison blank, and after they had stood for sometime, the surface showed the presence of a

1293 blue mold, which made them very rough and spoiled any record that happened to be made on them.

Q. 32. Did you succeed, or did Mr. Macdonald to your knowledge succeed, or did both of you together succeed in overcoming the objection to which you have referred, namely, the appearance of the blue mold on the surface of the blank after standing for sometime?

A. No, after a quantity of these blanks had been
1294 made and shipped to the Columbia Phonograph Company, who used them for making musical records, they developed this fault of blue mold on them and no further experiments were made by me, as I left the employ of the Graphophone Company.

Q. 33. Then, as I understand it, you actually attempted to make blanks on a commercial scale?

A. Yes, several thousands of them were made, just the quantity I can't remember. I am under the impression that about three thousand were made and
1295 shipped to the Columbia Phonograph Company, and were found to blue mold and all work was shut down.

Q. 34. Do you recall when these several thousand blanks were made for the Columbia Phonograph Company?

A. It was during the Spring of 1894. I left the early part of May of the same year. This date is only approximately given, as I cannot remember the exact date that I severed my connection with the Grapho-
1296 phone Company.

Q. 35. Was it before or after the North American Phonograph Company failed?

A. It was the Spring before the North American Phonograph Company failed.

Q. 36. Why are you certain of this fact?

A. Because I secured a position with the North American Phonograph Company and remained with them until they went into the hands of the Receiver, which I think was in August, 1894.

Q. 37. Were the several thousand blanks, which you

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made for the Columbia Phonograph Company in the Spring of 1894 the best blanks that you had made up to that time?

A. They were.

Q. 38. Was there any objection to them, other than the formation of the blue mold, to which you have referred?

A. Yes, I don't think they were as good as the Edi-
son blank, which was considered to be the best mate-
rial for the purpose, as the reproduction of the record 1298
was very rough.

Q. 39. Do you recall the composition, that is to say, the materials used, in connection with the several thousand blanks made for the Columbia Phonograph Company?

A. You understand of course that these blanks were
made by the American Graphophone Company
and sold to the Columbia Phonograph Company. It
would be impossible at this time to give you the exact
formula, but the composition was partly saponified 1299
quantity of stearic acid, with a proportion of ozocerite
added, and also a quantity of litharge and a small quan-
tity of acetate of lead.

Q. 40. Do you remember with what alkali the stearic acid was saponified?

A. Sal-soda or washing soda.

Q. 41. Do you remember the process, which you followed in making these blanks, and if so, please explain with as much detail as possible?

A. We used in making the composition a large iron 1300
kettle, which was heated by a gas burner, I first melted
the stearic acid, adding the ozokerite, then partly
saponifying it; after this the lead was added in the
form of litharge and acetate of lead. My impression is
that I endeavored to keep this mixture at a tempera-
ture of about 375 degrees F. After all moisture had
evaporated, from the addition of the soda, the mixture
was poured out in iron pans to cool.

Q. 42. What do you mean in the above answer by the words "saponifying *it*"?

1301 A. What I mean to say is that the stearic acid is saponified, of course it would be impossible to saponify the ozokerite. It made, so far as I can recollect, very little difference as to whether the ozokerite was added before the alkali or afterwards.

Q. 43. In what form did you add the sal-soda ?

A. The soda was added in crystal form.

Q. 44. Was there very much foam or bubbling developed in the process of manufacture ?

1302 A. Yes, when the soda was added, the mixture would foam up and in order to prevent the material from running over, we had a large sheet iron jacket around the top of the kettle.

Q. 45. Under what circumstances did you leave the employ of the Graphophone Company ?

A. When the blanks developed the blue mold, Mr. Macdonald was telegraphed for to come to Washington to discuss the matter, I understood, with Mr. Easton, who was then General Manager of the Company. He,

1303 Mr. Macdonald, telegraphed the factory to shut down the Cylinder Department with the exception, I believe, of one man. The factory at this time was running on short time and when he returned he told me that I would have to be put on the short time rate, and as this was not satisfactory to me I resigned my position.

Q. 46. Was there a man employed at the Graphophone Company when you were there named Fargo ?

A. Yes, he was employed in my Department and was the only man kept on, excepting myself when the

1304 Department was shut down.

Q. 47. What, so far as you know, was Mr. Fargo's reputation for truth and trustworthiness ?

A. Personally, I always found him to be a very reliable energetic young fellow ; he had been formerly employed by the American Graphophone Company as carpenter or mill-wright, and was thought very highly of.

Q. 48. When you commenced your experiments at Bridgeport, did Mr. Macdonald say anything to you about the practicability or impracticability of the

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paper tube-ozokerite graphophone blanks, then made by the Graphophone Company ?

A. Yes, we had numerous discussions as to the question of blanks and he often stated that in his opinion they would never make a success of the graphophone until a more satisfactory blank was made.

Q. 49. Did he state that he considered the Edison blanks to be satisfactory ?

A. The Edison blanks were supposed to be entirely 1306
satisfactory and all our efforts were to endeavor to make a blank equally as good.

Q. 50. Are you the same Eben G. Dodge, who subscribed to an affidavit on December 7th, 1894, for use in opposition to a motion for preliminary injunction in a suit entitled " American Graphophone Company vs. Cleveland Walcutt *et al.*," in the United States Circuit Court for the Southern District of New York?

A. Yes the affidavit you refer to was made by me.

Q. 51. This affidavit then was made the same year 1307
that you left the Graphophone Company ?

A. Yes.

Q. 52. Did you consider this affidavit carefully before you signed it ?

A. I certainly did, I would not sign an affidavit without doing so.

Q. 53. Did you have something to do with the actual drafting of this affidavit ?

A. I had numerous conferences with Mr. Edmonds
(who appeared as counsel for defendants in that suit) 1308
and when the affidavit was prepared, if I remember correctly, I made a number of corrections before signing the affidavit.

Q. 54. I will quote on the record the material points in this affidavit, bearing on the present suit, and will ask if the statements therein made, agree with your present recollection of the circumstances alleged to be stated therein :

" From April 12, 1893, until some time in May, 1894, I was again engaged at the Bridgeport factory of

1309 the American Graphophone Company in the way of experimenting upon cylinders for use in connection with the graphophone.

At the time that I commenced my experiments at Bridgeport on graphophone cylinders—that is to say, on or about April 12, 1893, the American Graphophone Company had in use and on sale a single type of cylinder for the recording and reproduction of sound. This cylinder was composed of a paper tube,
1310 coated with a thin, flexible and soft layer of ozocerite wax. In some instances, this wax contains an admixture of paraffine.

The graphophones in connection with which these cylinders were used were found decidedly objectionable by users for various reasons, among which were, that the wax with which the paper tube was coated was quite soft, and owing to this the point of the recording style was dulled, probably from impurities in the ozokerite; and that, also, owing to the use of
1311 a soft wax, the material was not cut sharply from the groove, but was permitted to tear, under the action of the style, whereby the record groove was made rough, and this conduced to a confusing of the articulate sounds. Added to this the material clogged up the style, thus increasing the confusion of the sound. Another objection, and one found very important, in the use of these cylinders, was that, owing to the softness of the material, the minute elevations and depressions in the sound grooves were readily levelled
1312 off by the action of the reproducer passing thereover; that is to say, the material did not have sufficient stiffness to withstand a rubbing action of the reproducer as it passed through the groove for the purpose of reproducing sound from the record therein. Furthermore, with these cylinders it was impossible to record and intelligibly reproduce the hissing sounds so common in speech. These objections were well recognized and understood at the time I refer to, and experiments were carried on continuously for the purpose of avoiding them.

1313 As an expert in this art I devoted a considerable time to the study of these objections, and to considering various modes of improving the apparatus, having the said objections in view, and to this end I was sent by the Graphophone Company to its Bridgeport factory, where I conducted a line of experiments in connection with wax cylinders, which lead eventually to the soft cylinders or ozokerite cylinders above referred to, being discarded and superseded by heavier cylinders composed of very much harder material, consisting 1314 principally of metallic soap. Previous to the time that I took up this work, however, the experiments had been carried on by Thomas H. McDonald, the factory manager and superintendent of the Graphophone Company, at its Bridgeport factory. Mr. McDonald had the same theory that I had concerning the improvement of the graphophone, so as to avoid the difficulties above mentioned; indeed, Mr. Easton who was made general manager of the company on or about the first of May, 1893, 1315 also recognized the fact that the soft cylinders were decidedly impracticable, because, very shortly, after his assuming that position, he, to a great extent caused these soft cylinders to be discarded, employing in their place hard phonograph cylinders purchased by him I understood, from the Edison Phonograph Works for the use of the Columbia Phonograph Company, of which said Easton was at that time president. At the present time, according to my information and belief, very few, if any, of the soft ozocerite wax 1316 cylinders are being placed upon the market by the Graphophone Company. The phonograph cylinders, that is to say, cylinders made by the Edison Phonograph Works for use on phonographs, and hard metallic soap cylinders, the manufacture of which has comparatively recently been taken up with the Graphophone Company, have almost, if not entirely superseded the said ozokerite cylinders.

The hard cylinders referred to as being made by the Graphophone Company are of two types, but made of

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the same composition. One of these known as the
" P cylinder " is in appearance the exact counterpart
of the cylinder manufactured by the Edison Phono-
graph Works. Indeed, immediately after their con-
struction, it would be difficult, if not impossible, to
tell one of these " P cylinders " from an Edison cylinder
without testing them on the machine. Like the latter,
the Graphophone Company cylinder is of metallic
soap, it is of the same dimensions and it is even pro-
1318 vided with the internal screw thread peculiar to the
Edison cylinder. * * * In addition to the ob-
jections, which I have heretofore stated in connection
with these two types of hard cylinders, it was found
that shortly after being molded and turned down, a
bluish-white incrustation, resembling mold, appeared
upon the surface and the longer the cylinders stood
before being used the greater became this mold or in-
crustation. This was found very objectionable by
users, especially in connection with cylinders on which
1319 records were made which were designed to be perma-
nent, for the mold would form in the record groove
and in reproducing the record, this conduced to con-
fusion of the sounds and the production of scratching
noises. This objection too was fully recognized by
the Graphophone Company, and particularly by its
manager, E. D. Easton. It was one of the causes
which in May 1894 induced the Graphophone Com-
pany to discontinue the manufacture of cylinders.
Prior to this, however, every effort was made to avoid
1320 the difficulty. During the early experiments, the
Graphophone Company even went so far as to pur-
chase from the United States Phonograph Com-
pany, a quantity of fragments of phonograph cylinders
of metallic soap (known as 'scrap wax') made
by the Edison Company and this was melted down
at the Bridgeport factory and re-melted into new
cylinders. It was found that the cylinders made from
this Edison Company material did not have the ob-
jectionable feature of incrustation referred to.

The manufacture of cylinders like the hard type re-

1321 ferred to was commenced sometime in the Fall of 1893, and continued to some extent up to the time I left the Graphophone Company in May 1894.

I do not wish to be understood that these hard cylinders were manufactured in any large quantities by the Graphophone Company, for this is not the case. In fact, the manufacture of these cylinders initially was experimental, and after such experimental construction they were manufactured only to a limited extent." 1322

A. They do.

> Counsel for defendant offers to the inspection of complainant's counsel for the purposes of cross-examination the record entitled "Defendant's Papers in Opposition to Motion for Preliminary Injunction" in the suit entitled—American Graphophone Company vs. Cleveland Walcutt *et al.* in the United States Circuit for the Southern District of New York and containing the entire affidavit of Mr. Dodge from which quotations have been made in the above answer. 1323

Adjourned until Wednesday February 7th, 1906 at 10.30 A. M.

ORANGE, NEW JERSEY, Feb. 7, 1906

1324 Met pursuant to adjournment.

Present :

C. A. L. MASSIE, ESQ., for complainant.
FRANK L. DYER, ESQ., for defendant.

> Counsel for defendant offers in evidence copy of an affidavit made by the witness Eben G. Dodge on November 27th, 1894, in the suit brought in the United States Circuit Court for the District of New Jersey, entitled "American

1325 Graphophone Company vs. The United States Phonograph Company *et al.*", and corresponding with the affidavit made by the witness in the suit against Cleveland Walcutt *et al.*, referred to in question 53, and the same is marked "Defendant's Exhibit, Dodge Affidavit."

It is admitted by counsel for complainant that the copy above introduced is a correct copy of the original affidavit now on file in the records

1326 of this Court and which was filed on December 4th, 1894, on behalf of defendants in the suit entitled "American Graphophone Company vs. The United States Phonograph Company *et al.*"

This admission is made subject to comparison with the original on file, but the exhibit is objected to as irrelevant and immaterial and as being incompetent.

CROSS-EXAMINATION BY MR. MASSIE.

1327 Complainant's counsel now enters timely objection to Qs. 29 and 30 as hearsay and incompetent, the same objection to Q. 48. Q. 54 is objected to as incompetent, not calling for the best evidence of facts recited in the question.

x-Q. 55. Please state as near as you can the date when you began your experiments at Bridgeport in connection with the material for blank cylinders?

1328 A. My impression is that it was sometime during the month of July, 1893, but of this point I am not positive.

x-Q. 56. And you discontinued that work about May 1894?

A. No, I left the American Graphophone Company about May, 1894, but the experimental work carried on by myself was, if I remember correctly, discontinued sometime during March of the same year.

x-Q. 57. What were you doing between March and the time you left the Graphophone factory?

1329

A. Making cylinders.

x-Q. 58. Have you done any work since May, 1894, in connection with making cylinders or carrying on experiments in that line ?

A. None.

x-Q. 59. Is the Battery Supplies Company, of which you are now an officer, engaged in handling any of Mr. Edison's inventions; that is, is this concern affiliated with Mr. Edison's work ?

1330

> Objected to as irrelevant and immaterial, and the witness is instructed that he is not called upon to answer the question. Mr. Edison is not a party to this suit.

A. I decline to answer upon advice of counsel.

x-Q. 60. In answer to question 29, you say you studied the behavior of the material obtained from the quantity of broken Edison blanks. Did you attempt to analyze this material so as to ascertain its contents ? 1331

A. No, I did not attempt to analyze it, for the reason that I am not a chemist. It would have been impossible for me to do so.

x-Q. 61. So far as you know did Mr. Macdonald make this attempt while you were at Bridgeport in 1893 and 1894 ?

A. I don't believe he did, certainly not to my knowledge.

1332 x-Q. 62. In answer to Q. 20, you say you started experiments under Mr. Macdonald's supervision. Can you give us a general idea as to how this supervision was carried on; that is, what and how much Mr. Macdonald had to do with your work ?

A. During the early experiments, Mr. Macdonald had practically everything to do with the work; I simply carried out his instructions.

x-Q. 63. In your answer to x-Q. 31, you speak of the effect of increasing the proportion of caustic soda, added to the given quantity of stearic acid. In carry-

1333 ing on this branch of the work, did you figure out beforehand, the proportions to be used, determining this from the chemical properties of ingredients; or did you make the mixtures first and then test them, and continue in this manner empirically?

A. In changing the quantity of caustic soda or any other alkali used, I endeavored to get as near as possible the same melting point as the Edison mixture.

x-Q. 64. Referring to the ingredients named by you 1334 in answer to Q. 39, please say what was the purpose of adding the ozokerite?

A. My recollection is that the addition of ozocerite was an improvement.

x-Q. 65. What was the function or effect of the ozokerite?

A. I can't say that I can remember.

x-Q. 66. The same answer, Q. 39, names "litharge". What is this?

A. Oxide of lead, I believe.

1335 x-Q. 67. As I understand the answer, the Graphophone Company used both oxide of lead and acetate of lead. What was the purpose in using both of these ingredients?

A. My impression is that by adding the acetate of lead, we got a more perfect mixture than when the oxide of lead was used alone.

x-Q. 68. Why was not acetate of lead then used exclusively, without using any oxide of lead?

A. Acetate of lead was more expensive than oxide 1336 of lead.

x-Q. 69. What was the effect or function of each of these two ingredients, namely, oxide of lead and acetate of lead?

A. It changed the nature of the composition.

x-Q. 70. In what respects did the formula or composition referred to in your answer to Q. 39, differ from what Mr. Macdonald had attempted to do, as set forth in your answer to Q. 29, where you speak of a mixture of stearic acid saponified with caustic soda, to which was added a small quantity of litharge"?

1337

A. The attempts made by Mr. Macdonald referred to in my answer to Q. 29, as I remember them, contained too much alkali and too much lead, in the form of litharge or oxide of lead, and did not contain any acetate of lead.

x-Q. 71. What proportion of stearic acid and alkali did you use at the beginning of your experiments at Bridgeport?

A. It is impossible for me to remember.

x-Q. 72. How did you discover that an increase of the 1338
amount of caustic soda would raise the melting point of the composition; that is, how did you come to vary the amount of the caustic soda, what suggested that variation?

A. We endeavored to make a mixture as near like the Edison composition as possible and we also found by using a small amount of caustic soda or alkali, it was easier to mold the blanks. The fact referred to was brought out by experiments.

x-Q. 73. Then, as I understand you, before those 1339
experiments you did not know that an increase of the caustic soda would raise the melting point of the mixture?

A. I did not know this fact until I had made a number of experiments.

x-Q. 74. What lead you to vary the amount of caustic soda; that is, what was your line of thought or reasoning, if you now recall it?

A. Well it is impossible at this date to give you in
detail just what prompted the various experiments, 1340
but I would state that with some of the first experiments made we used castile soap and added litharge. We found this to melt at a very much higher temperature than the composition used in the Edison blanks, and in endeavoring to get the same melting point we varied the quantity of alkali used, finding that by increasing the amount thereof to a definite amount of stearic acid the mixture melted at a higher temperature. We consequently decreased the amount to make

1341 it conform as near as possible to the Edison composition.

x-Q. 75. Who actually did the work in these experiments where the amount of alkali was thus varied?

A. The early experiments were made jointly by Mr. Macdonald and myself. I do not remember just how long this work was continued, but I should say the most of the experiment work done, the actual work, was done by myself.

1342 x-Q. 76. After those earlier experiments by Mr. Macdonald and yourself, what part did Mr. Macdonald take in the work, the actual work which was done by yourself?

A. A great many experiments were made by me personally and according to my ideas, but at the same time I made experiments according to Mr. Macdonald's suggestions.

x-Q. 77. Can you recall any of the suggestions which he made with regard to these experiments?

1343 A. I recall the fact that he suggested the use of acetate of lead after a composition had been submitted by a Mr. English, which contained an acid. This was determined by the very acid odor that the composition had. As to any suggestions from Mr. Macdonald on the quantities of alkali that were used, it would be impossible for me to recall any exact amounts that he suggested might be used.

x-Q. 78. That is, he suggested that you use different
proportions of the alkali, but you do not remember
1344 what proportions he suggested; is that it?

A. Yes.

x-Q. 79. In answer to Q. 41 and Q. 42 you say it made very little difference whether the ozokerite was added to the stearic acid before the alkali was added, or afterwards. Did it make any difference, and if so, what?

A. I cannot recall that it made any difference.

x-Q. 80. You also say that after saponification, the leads salts were added. Were the leads salts ever added before saponification?

1345

A. It is very probable that they were.

x-Q. 81. Why do you say that it is very probable?

A. Because a number of experiments were made without saponifying the mixture.

x-Q. 82. Have you any present recollection that the lead salts were added before saponification and the mixture after saponified, and if so, how were they added, as near as you can now recollect?

A. I am not quite clear as to whether the lead salts were added before saponification, but my impression is 1346 that they were. I refer to incomplete saponification. If the lead salts were at any time added before partial saponification, the method pursued was to melt the stearic acid and add the lead salts.

x-Q. 83. In question 54, defendant's counsel gives a long quotation from an affidavit made by you, and towards the end of this quotation you refer to the fact that in May 1894, the Graphophone Company was induced to discontinue the manufacture of cylinders. Was this before you left the employ of that company, 1347 or at the same time?

A. When I state that I left the American Graphophone Company early in May, it is possible that I may be ten or fifteen days out of the way; it might have been in the latter end of April, but the manufacture of blanks was stopped two or three days before I left them.

x-Q. 84. In the beginning of the fourth paragraph of the same quotation in Q. 54, you say: "As an expert in this art I devoted a considerable time to the study 1348 of these objections," what work or study did you there have in mind?

A. It was my opinion that the success of the phonograph was largely due to the use of the metallic soap blank, and while I had been originally sent to the factory to make a number of ozokerite blanks for use in machines that were to be exhibited at the World's Fair, I was unable to make a cylinder that worked as satisfactorily as the Edison blanks did on the phonograph.

1349 x-Q. 85. In the same passage, you continue that you devoted a considerable time "to considering various modes of improving the apparatus." What study and work did you do in this regard ?

A. The only actual work done for the Graphophone Company was experimenting with various kinds of knifes for shaving the surface of the ozkoerite blanks.

x-Q. 86. In your opinion did you invent the process
or formula employed in making the graphophone
1350 blanks ? I mean the composition now employed by
the Graphophone Company ?

> Objected to as immaterial, irrelevant and misleading, as the witness has not testified concerning the present composition used by the Graphophone Company.

A. No, certainly not.

x-Q. 87. Are you familiar with the formula and
1351 process set forth in Macdonald patent here in suit ;
and if so, are you in your opinion the inventor thereof ?

A. I am not familiar with Mr. Macdonald's patent, and certainly do not claim to be the inventor of the composition. As a matter of fact, I have never seen the patent.

x-Q. 88. In x-Q. 57 you say that between March, 1894, and the time you left the Graphophone factory, you were making cylinders. Were these cylinders made as indicated in answer to Q. 39 ?

1352 A. Yes.

x-Q. 89. Were you ever engaged in the occupation of selling phonographs ?

A. Yes.

x-Q. 90. When and where ?

A. For the North American Phonograph Company sometime in May 1894 until August of the same year.

Cross-examination closed.

Signature and certificate waived.
Adjourned subject to notice.

1353

Stipulation.

It is hereby stipulated and agreed by and between
counsel for the respective parties in this cause that 1354
any depositions taken by either party in the companion
suit on Macdonald patent No. 626,709, entitled
"American Graphophone Company vs. National
Phonograph Company in Equity, No. 11 March Term
1905", or in the suit pending before this Honorable
Court entitled "New Jersey Patent Company vs. The
Columbia Phonograph Company, General, No. 12,
March Term, 1905" on Aylsworth patent No. 782,375,
may be introduced wholly or in part at any time before
the closing of the proofs by either party with the 1355
same force and effect as if duly and regularly taken
herein; and it is further agreed between counsel that
any exhibits which may be introduced by either party
in suits Nos. 11 and 12, above referred to, or properly
authenticated copies thereof, may be introduced as exhibits
in this cause with the same force and effect as if
duly and regularly presented and introduced herein.

1356

1357

IN THE CIRCUIT COURT OF THE UNITED STATES,

FOR THE DISTRICT OF NEW JERSEY.

AMERICAN GRAPHOPHONE COMPANY
1358 vs.
NATIONAL PHONOGRAPH COMPANY.

In Equity, No. 10.
March Term, 1905.
On Macdonald Patent No. 606,725.

Proofs for final hearing taken on behalf of the defendant at Rooms 13 and 14, United States Post Office Building, Evansville, Indiana, before J. W. WARTMANN, ESQ., United States Commissioner, commencing Monday, February 12, 1906, at 10:30 o'clock A. M. 1359

Present: C. A. L. MASSIE, ESQ., for complainant. FRANK L. DYER, ESQ., and MELVILLE CHURCH, ESQ., for defendant.

Adolph Melzer.

ADOLPH MELZER, a witness produced in behalf of the defendant, being duly sworn, deposes and says, in 1360 answer to interrogatories propounded to him by Mr. Dyer, counsel for defendant, as follows:

Q. 1. State your name, age, residence and occupation?

A. Adolph Melzer, 60, Evansville, Indiana, manufacturer in soaps.

Q. 2. Do you know Thomas H. Macdonald, manager of the American Graphophone Company's factory, at Bridgeport, Conn. (said Company being the complainant in this suit) and if so, when did you first become acquainted with him?

A. Personally I became acquainted with him in

1361 1895; by correspondence I became acquainted with him in 1894.

Q. 3. I show you a copy of Patent No. 606,725, granted to Thomas H. Macdonald, for manufacture of graphophone tablets, dated July 5, 1898, and the application for which was filed November 27, 1896, and ask you to state whether or not you have read and understand this patent and are familiar with the invention described and claimed therein?

A. I have and I am. 1362

Q. 4. If you have any knowledge concerning the origin and history of the invention described and claimed in this Macdonald patent will you please state the same? Please answer fully.

A. My connection with the American Graphophone Company was brought about on the occasion of a visit to Chicago, in August, 1894, when the Editor of the American Soap Journal, Mr. H. Gathmann, showed me a letter from the American Graphophone Company, of which the following is a copy: "We have been kindly 1363 referred to you by the Enos F. Jones Chemical Co., of New York. We desire to obtain the services of a competent man, who is thoroughly informed in the principles of hard soap making. Our work is not soap making, in the ordinary sense, but still the material we use is a true soap made from stearine. We use it for making records upon the graphophone and phonograph. We desire a man who is capable of carrying on a certain amount of experimental work intelligently. One who is thoroughly posted in all the details of the manipula- 1364 tion of soap materials. Can you suggest any material that would be likely to prevent, when mixed with soap material, the discoloration or cloudy appearance on the hard clear surface of such soap?

The mixture I use is made from stearine, caustic soda, ozokerite, and acetate of lead. I mix the stearine and ozokerite, eight of stearine and one of ozokerite, then add about $\frac{1}{8}$ the weight of caustic soda; after this has boiled for twenty-four to thirty hours, I add about 10% of acetate of lead or common litharge. The

1365 mixture is an exceedingly hard brown mixture. I mail you in a separate box a number of samples. Now, our chief difficulty arises after some days. The mixture is moulded into cylinders and shaved off smoothly, but after standing for a time it will become covered with a cloudy mould, which will always reappear even after repeated brushing.

If you could suggest anything that will cure this we will be greatly obliged."

1366 There also appeared in the American Soap Journal, of September, 1894, the following advertisement:

"Wanted: Thoroughly practical man, capable of carrying on experimental work in hard soap making. Work is on a metallic insoluble soap, not used for washing purposes. One versed in the working of stearine, waxes and lead soaps, greatly to be preferred. Address, T. H. McDonald, Manager, Bridgeport, Conn."

The subject of making a soap, which would take and
1367 reproduce records of sound, interested me very much and I concluded to answer the above quoted letter and advertisement, offering to undertake the experiments mentioned. In answer to my letter in which I mentioned incidentally that stearic acid would be more suitable than stearine, and in which I inquired what per cent. of water the mixture should contain, and that caustic soda ought to be employed in solution, Mr. Macdonald wrote me, September 11, 1894, that in case we should agree upon undertaking this work, he
1368 would furnish me with the data in his possession regarding the mixture and then went on to say that in making the mixture, he does not use any water at all; that he usually melts 320 lbs. of "A. A." brand stearine, not stearic acid. When thoroughly melted he adds about 50 lbs. of black ozokerite, he then adds slowly 40 lbs. of acetate of lead and when thoroughly united adds caustic soda in powder form to the extent of about 32 lbs. The mixture is then cooled and molded.

Furthermore Mr. Macdonald wished to know as to

1369 the probable expense of the experiments, time when they could be commenced, and where it would be necessary to do the work

Answering this letter, on September 14, 1894, I wrote to Mr. Macdonald that we (my brother, Charles Melzer and myself) would undertake the experiments, and would charge nothing if we failed ; on the other hand, if we succeeded in producing an article in every way suited to his wants, we would expect a remuneration corresponding to the value of our time and labor and 1370 felt satisfied there would be no trouble in agreeing upon that question.

Replying to this letter Mr. Macdonald said that our proposition is a fair one and he would be glad to have us go ahead with the work. He also sent us a box of samples of the mixtures he had used, together with the raw materials. He also stated in the letter that he had found the best mixture to be as follows : Stearine, 24 lbs., caustic soda 40 oz., acetate of lead, 40 oz., and ozokerite 3 lbs. As to the properties that the mixture 1371 should possess, Mr. Macdonald said in his first letter that first of all it must admit of a good record. To this end it is necessary that it be a hard, homogenous close grained mixture. There must be no tendency to gumminess or stickiness, if there is, the recording tool will at once be clogged up and the record be seriously affected. The mixture, after the record is placed upon it, must not mould, effloresce or change character in any way. If it does, the fine and delicate record, placed upon its surface, will be destroyed, which has been 1372 their greatest trouble. "The mixture must be of such character that it will mold easily. To this end it is necessary that it pass from the melted liquid state to a jelly like consistency and thus harden slowly. This admits of easy removal from the mold."

It appears that I requested Mr. Macdonald to send us a mold for the purpose of molding and testing the experimental composition, but under date of October 1, 1894, Mr. Macdonald writes that this is not practicable, as his molds are attached in gangs of ten each, 1373 and that we should send him the mixture in cakes of three or four lbs. each, when he would mold it and report the results.

With this data for a start, I began the experiments and made up three samples of cylinder compositions, composed of stearic acid, ozokerite, paraffine wax, oxide of lead, and caustic soda in solution, of different proportions. These were sent to Mr. Macdonald on October 20, 1894.

1374 On October 31, 1894, Mr. Macdonald reported that he has tested the mixtures sent him and finds the results fair, but that they are all "too gummy" and that he now doubts the wisdom of using ozokerite, but would like to have us try some variations on the line of the "white mixture" (for this we had used paraffine wax), and send him samples from time to time.

On November 7, 1894, we wrote to Mr. Macdonald that the word "wax" together with the fact that the cylinders should readily take delicate indentations, 1375 lead us to believe that the compositions ought to be hard, yet plastic, and not so brittle as the samples he had sent us, and that the "gumminess" could be easily remedied. Further we stated that after having experimented with almost every known metal, wax and gum, we find that only three metals are available for this purpose, and that of these three, the one represented by samples of compositions D and E sent him by express on that day, is in our opinion the best. (Samples D and E were made with hydrate of alumi- 1376 num. The other metals referred to were oxyhydrate of tin and oxide of lead). It should be specially noted here that Mr. Macdonald up to this time had not suggested the use of any materials other than those mentioned in his letters of August and September 11, 1894, and that his report on the samples of compositions sent him October 20 was confined to the simple statement that they are too "gummy" and that the mixture should be of such consistency that the chips when cut from the surface will crumble into powder.

On November 17, 1894, Mr. Macdonald writes that

1377

the last compositions sent him were all right, mold readily, are easily shaped and prepared for the record and that the record has good qualities, being smooth and brilliant; that if we would send him a statement of our expenses, that we had incurred, he would take care of the same. In addition he wished to know if it would not be best for him to come to our factory and thoroughly learn the process of properly making the composition so he would make no mistake.

Replying to Mr. Macdonald November 19, 1894, we 1378
stated that we should prefer to continue the experiments and further improve the composition until it is absolutely right and that in view of the importance, he could then afford to pay a liberal price for our work.

On December 3, 1894, we sent to Mr. Macdonald five additional samples of composition, all made with hydrate of aluminum, and requested him to send us a few cylinders with records made from these compositions
so that we could examine contour of the indentations 1379
and that it might also be a good idea if he would send us a graphophone so that we could hear the records.

On December 8 Mr. Macdonald telegraphed (telegram was not saved) asking for bill of expenses and privilege to visit us at our factory.

On December 31, 1894, we expressed to Mr. Macdonald, in consideration of a graphophone, storage battery, and some records, two boxes containing samples of standard composition, materials used for same, some
laboratory glass ware and book containing recipe and 1380
full directions for making the composition. Also addresses and all other information that we believed might be useful to him. We retained no copy of the book but by reference to our records find that the standard composition sent him with recipe was composed of fifty-one parts stearic acid, 10⅝ parts 37° caustic soda lye, 9 parts paraffine wax, and ⅞ parts hydrate of aluminum. (These figures multiplied by 8 are the ones mentioned in Mr. Macdonald's patent of July 5, 1898 under Formula A.)

1381

On January 22, 1895, Mr. Macdonald writes that he will go to Chicago, within ten days or two weeks and wants to know if it will be agreeable to us if he were to stop at our place for three or four days, for the purpose of going over with us the matter of making the cylinder composition. On January 25, 1895, we wrote to Mr. Macdonald that we would be glad to have him come and stay as long as he pleased. On January 31, 1895, Mr. Macdonald writes us that he will leave direct
1382 for Evansville on the following Wednesday.

Mr. Macdonald arrived here on February 9, 1895, and remained with us until February 19th.

On February 24, 1895, Mr. Macdonald writes complaining that his composition is not quite as good as that we made here, it is more gummy and the cylinders have a good many "pin holes."

On February 27, 1895, he again complained about "pin holes".

On March 4, 1895, he complains about "pin holes"
1383 but says that in all other respects the cylinders are good.

On March 29, 1895, Mr. Macdonald complains bitterly about the "pin holes".

On April 8, 1895, Mr. Macdonald writes complaining still about the "pin holes" and mentions that he has made some cylinder composition with acetate of aluminum which he has been informed, has been used by the Silver Lake people for more than two years. These cylinders, he says, turn out very satisfactory.

1384 On April 12, 1895, Mr. Macdonald again complains of "pin holes" and crystallization, and states that he has made up a large number of cylinders by the "dry process", using acetate of aluminum and dry caustic soda.

February 24 to April 16, 1895, my brother made analyses of a piece of cylinder composition received of Mr. Macdonald and supposed to be Mr. Edison's composition. Mr. Macdonald considered this composition as being of superior quality and was anxious to have it duplicated exactly. We designated this sample, "Composi-

1385 tion X ", and the analyses showed that it contained a rather large per cent of aluminum oxide and sulphuric acid, indicating that some form of sulphate of alumina had been employed in its composition.

On May 4, 1895, Mr. Macdonald complains again about " pin holes ", stating that he has lost fully 50% of his cylinders from this cause.

On May 16, 1895, he writes that the so-called " dry mixture " made with acetate of aluminum, is of no use and that he will not touch it again with a forty 1386 foot pole ; he also states that he has tinned the inside surface of his molds and had buffed and nickel-plated them but that this has not remedied the " pin-holes ". He finds some relief by employing a high temperature. On June 22, 1895, Mr. Macdonald writing says that he has little trouble now with crystallization and if he could only get rid of those pesky " pin-holes " he would be happy.

Replying to this last letter we wrote Mr. Macdonald, under date of June 30, 1895, that we were convinced 1387 his trouble with the " pin-holes " was due to faulty mechanical arrangements, and that we would be willing to enter into an arrangement with his company to make the cylinders for him or if this does not suit him that the writer would come to Bridgeport, and spend a week or two with him to relieve him of his trouble with the " pin-holes ".

On July 2, 1895, Mr. Macdonald writes, accepting offer to visit him at Bridgeport.

I arrived at Bridgeport July 19, 1895, remaining 1388 until the 30th. Worked every day and all the cylinders made during this time were practically minus " pin-holes ".

Mr. Macdonald's subsequent letters mention a steadily increasing business and no longer complain about " pin-holes ".

On September 3, 1896, Mr. Macdonald writes that he has recently learned through a party who pretends to know that the phonograph cylinder is made of stearic acid, caustic soda, sal-soda, aluminum bronze powder, 1389 white ozokerite and water, and wishes to know what we think of this.

I took no copy of our letter in reply, but think I remember saying that we found no advantage in using carbonate soda in place of caustic, nor in using metallic aluminum in place of the hydrate; any way, if metallic aluminum was used at all, scrap aluminum would answer as well or better than the very expensive aluminum bronze powder.

1390 On September 21, 1896 Mr. Macdonald writes that the party referred to in his letter of September 3, made up for him about four hundred cylinders composed as nearly as he can judge, of 100 lbs. stearic acid, 23 lbs. sal-soda, 1 lb. caustic soda and 6½ oz. aluminum bronze powder dissolved in about five gallons of water. (These figures multiplied by three correspond practically with formula B in Macdonald's patent of July 5, 1898).

October 6, 1896, Mr. Macdonald writes that he has 1391 made up a lot of cylinders with scrap aluminum as per our directions.

October 17, 1896, Mr. Macdonald writes that he is assured every cylinder made at the Edison works during the last four years has been made with aluminum bronze powder.

Q. 5. Please examine the copy of The American Soap Journal and Perfume Gazette, of September 1, 1894, which I show you, and state whether or not it contains the advertisement of Mr. Macdonald which 1392 you answered?

A. Yes, this is the publication referred to and the advertisement appears on page 209, as follows:

> "WANTED. Thoroughly practical man capable of carrying on experimental work in hard soap making. Work is on a metallic, insoluble soap not used for washing purposes. One versed in the working of stearine, waxes and lead soaps greatly to be preferred. Address: T. H. MACDONALD, Manager, Bridgeport, Conn.',

1393 (Counsel for defendant here offers in evidence the copy of the publication referred to and the same is marked, "Defendant's Exhibit, American Soap Journal of September 1, 1894".

Q. 6. Can you produce the letter from Mr. Macdonald referred to in your answer to question 4, and dated September 11, 1894.

A. I now produce it.

1394 Q. 7. Kindly read the letter which you have produced so that the same may appear on record.

A. The letter is as follows :

"September 11, 1894.

A. Melzer, Esq.,
Evansville, Ind.

Dear Sir : Pardon my delay in answering your esteemed favor of Sept. 1st. I have been away from the factory for a week and the matter was held awaiting my return. 1395

We are endeavoring to obtain a composition for the purpose of making records upon the Graphophone that shall be an improvement on that we now use.

Our chief difficulty lies in a clouding or corrosion of the surface after it has been shaved ready for the record.

We have been using the composition noted in my letter to Mr. Gathman That gives the best results we have yet obtained. 1396

In case we should agree that you would undertake to work for us, of course we would furnish you with all the data in our possession regarding the mixture.

Answering that portion of your letter I would say that we do not use water at all.

We melt, usually, 320 lbs. of 'A. A.' brand stearin, not stearic acid. When thoroughly melted we add about 50 lbs. black ozokerite. We then add slowly 40 lbs. of acetate of lead, 1397 and when thoroughly united add caustic soda in powder to the extent of about 32 lbs. The mixture is then cooled and moulded.

The object is to obtain a mixture that will be as hard as possible, and at the same time one that will cut under the recording stylus leaving a smooth surface.

If you will write me further giving me your ideas as to the probable expense of the experi-
1398 ment, time when the (work ?) could be commenced, and where it will be necessary to do the work.

Very truly yours,
T. H. Macdonald,
Manager Facty."

Q. 8. Can you produce a copy of your letter to Mr. Macdonald of September 1, 1894, referred to in his letter to you, above quoted ?

1399 A. No sir, I did not make a copy of it.

Counsel for defendant requests counsel for complainant to produce the original letter of September 1, 1894, from the witness to Mr. T. H. Macdonald.

Q. 9. Can you produce a copy of your letter of September 14, 1894, to Mr. Macdonald ?

1400 A. I produce a letter book in which the letter in question was first copied, the letter being as follows:

"September 14th, 1894.

T. H. Macdonald, Esq.,
Bridgeport, Conn.

Dear Sir: Your favor of the 11th inst. is just to hand. We will undertake the experiments for you, and will charge you nothing if we fail; if, on the other hand, we should succeed in producing an article in every way suited to your

1401

wants and satisfactory, we will expect a remuneration corresponding to value of our time and labor, and feel satisfied there will be no trouble in agreeing with you upon this question.

The experiments can only be made at our factory, where we have every facility for experimental work, and besides, neither one of us could think of leaving home for days or maybe weeks, as our manufactures are to a large extent
strictly original and require our personal at- 1402
tention.

As stated in former letter we would have to know all about the properties the composition should possess, as the substance suitable for graphophone cylinders, and washing soap are two things that seem to be very remotely related.

We would also request you to send us about 10 lbs. ozokerite as this is something that is not
used in soap making, and we do not know where 1403
to obtain conveniently. Also please send us a sample of your composition made recently.

We will commence on the experiments at once, and give to the work all the time we can spare, but of course, cannot foretell how soon we will have obtained definite results.

Hoping this will be satisfactory, we remain

Very Respy.,
A. & C. MELZER
pr. A. M." 1404

Q. 10. Who do you refer to in the above letter as "we"?

A. I refer to myself and my brother Charles.

Q. 11. Is your brother living?

A. No sir, my brother died July 24, 1905.

Q. 12. Was the letter of September 14, 1894, to Mr. Macdonald written by you or your brother?

A. By myself.

Q. 13. Can you produce Mr. Macdonald's letter to

1405 you in answer to your letter to him of September 14, 1894?

A. I produce Mr. Macdonald's letter which is as follows:

"Bridgeport, Conn., Sep. 19, '94.

Mr. A. Melzer,
Evansville, Ind.

Dear Sir: Your favor of recent date received.
1406 We think your proposition a fair one, and will
be glad to have you go ahead on the experimental
work.

We ship you today by Adams Express a box containing samples of all the mixtures we have used, also samples of the raw materials. With each sample I have attached a memorandum stating how the mixture was made.

There are several essential requisites in the
soap for our use. First of all it must admit of
1407 a good record. To this end it is necessary that
it be a hard, homogeneous, close grained mixture.
There must be no tendency to gumminess,
or stickiness. If there is the recording
tool will at once be clogged up and the record
be seriously affected.

The mixture after the record is placed upon it
must not mould, effloresce, or change character
in any way. If it does the fine and delicate
record placed upon its surface will be destroyed.
1408 This has been our greatest trouble.

The mixture must be of such character that it will mould easily. To this end it is necessary that it pass from the melted, liquid, state to a jelly like consistency, and thus harden slowly. This admits of easy removal from the mould.

I have found the best mixture to be as follows:

Stearine 24 lbs., Caustic Soda 40 ozs. Acetate Lead 40 ozs. Ozokerite 3 lbs.

1409

I mix the melted stearine and Ozokerite wax, and keep them at a temperature of about 300 degrees F. for two hours. Then slowly add the Caustic Soda. When this has thoroughly united, and all ebulition has ceased, I add the Acetate of Lead. The mixture will then congeal at a temperature of about 300 degrees F. It is kept just above this point for four or five hours and then moulded. Possibly, as you suggest, Stearic Acid would be better than the ordinary commercial Stearine. 1410

Our mixture is in fact a saponified Stearate of Lead with the addition of a little Ozokerite or Ceresine (which is refined Ozokerite).

We have not used water in the making and possibly therein have made an error.

The Stearine we have used has been purchased in part from A. G. Belden & Co., of New York.

Hoping that you will be able to see your way to some solution of our difficulties, we remain, 1411

Yours truly,
American Graphophone Co.,
By T. H. Macdonald,
Manager factory."

Q. 14. Can you produce Mr. Macdonald's letter to you of October 1, 1894, and if so please do so and quote on the record any reference therein to efflorescence? 1412

A. I produce the original letter which refers to the molds in gangs of ten and find the following statement relating to efflorescence: "It takes quite a time, if the weather is dry before the efflorescence appears on the surface."

Q. 15. In answer to Question 4 you have referred to cylinder compositions which were sent to Mr. Macdonald on October 20, 1894. Did you keep a record

1413 of these experiments, and if so will you produce the original record?

Objected to as irrelevant and immaterial, it not appearing that these experiments were themselves communicated to Mr. Macdonald.

A. I find in my record book, on page 9, the following entries:

1414 " October 15, 1894, made another batch composition as follows:

49 oz. Stearic Acid.
12 oz. Ozokerite.
10 oz. 40° Caustic Soda Lye.
4½ oz. Lead Oxide.
Temperature 150 degrees C.

October 16, 1894; another batch composed as follows: 1415

48 oz. Stearic Acid.
12 oz. Ozokerite.
10 oz. 40° Caustic Soda Lye.
6 oz. Lead Oxide.
Temperature 170 to 180 degrees. C.

October 19, 1894, another batch composed as follows:

1416 51 oz. Stearic Acid.
10 oz. Paraffine Wax.
10⅕ oz. 40° Caustic Soda Lye.
3¼ oz. Lead Oxide, prepared from the Acetate.
Temperature 150° C.

These samples sent by express to American Graphophone Co. Bridgeport, Conn, October 20, 1894."

Q. 16. The record book from which you have read was kept by whom?

A. Myself.

Q. 17. In whose handwriting do the entries appear therein ? 1417

A. Mine.

Q. 18. And when were the entries therein recorded made ?

A. At the dates which they bear.

Q. 19. Was it your custom to make entries in this book of the results of your efforts to produce the composition desired by Mr. Macdonald ?

A. I usually make memorandum of experiments conducted in the interest of our business. This particular book is started October 1, 1894, and this book contains experiments that cover the period from October 1, 1894 to December 5, 1899. 1418

Q. 20. I note that after each formula quoted upon the record you record the temperature. Will you please state what that record of temperature represents ?

A. It represents the highest temperature recorded on the Centigrade Thermometer used in stirring compositions in the course of making the same. 1419

Q. 21. Can you produce Mr. Macdonald's letter to you of October 31, 1894, in which he comments upon the three samples sent him on October 20th. If so, please read the same on the record ?

A. I produce the original letter which is as follows :

" BRIDGEPORT, CONN., Oct. 31, '94.

A. & C. MELZER,
Evansville, Ind. 1420

GENTLEMEN : We have carefully tested the mixtures sent and find the results fair.

They are all too gummy, and therefore do not make *good* records, as the cutting apparatus does not free itself readily. To get the best results we find it necessary to have the mixture of such consistency that the chip when cut away from the surface will crumble into powder. The

1421 chips when cut off with the shaving knife, or with any sharp tool, should crumble to powder under the slightest pressure of the fingers, and must have no suspicion of stickiness. The black mixture looked to be the best, but after testing I am inclined to say the white mixture gave the best results.

We are beginning to doubt the wisdom of putting in ozokerite. We think it will be as
1422 well to experiment without it, as it seems to introduce as bad elements as it cures, to say the least.

Would like to have you try some variations on the line of the white mixture, sending us samples from time to time for testing,

Yours truly,
AMERICAN GRAPHOPHONE CO.,
By T. H. MACDONALD,
Manager Factory."

1423

Q. 22. Are you able to state which of the mixtures were white and which black of those sent Mr. Mcdonald, on October 20, 1894 ?

A. The mixture made on October 19 and for which I used Paraffine Wax and was of a white color. The mixtures made October 15 and 16 were made with Ozokerite and were of a dark color. The mixture made October 19 was marked with the letter A. The mixtures made October 15 and 16 were marked B. and
1424 C. respectively.

Q. 23. After receiving Mr. Macdonald's letter of October 31, 1894, did you make any further experiments, and if so, did you make any records of the same in your record book ?

Objected to as immaterial.

A. I continued my experiments and find the next records on page 11, of my record book, as follows :

1425 "November 4, made on cook stove, composition for graphophone cylinders consisting of

55 oz. Stearic Acid.
7 oz. Paraffine Wax.
10 oz. 40° Caustic Soda Lye.
1 oz. Oxide of Alunimum.

Made another batch as follows :

1426

$48\frac{1}{2}$ oz. Stearic acid.
6 oz. Ozokerite.
9 oz. 40° Caustic Soda Lye.
1 oz. Oxide of Alunimum.

Also laboratory sample consisting of

$5\frac{1}{2}$ oz. Stearic Acid.
1 oz. Paraffine Wax.
$\frac{6}{17}$ oz. Stannous Oxyhydrate white.
and $1\frac{4}{17}$ 40° Lye. 1427
also $5\frac{6}{17}$ oz. Stearic Acid.
$\frac{13}{17}$ oz. Ozokerite.
$\frac{4}{17}$ oz. Stannous Oxyhydrate gray.
$1\frac{2}{17}$ oz. 40° Caustic Soda Lye.

These samples were marked respectively D, E, 1 and 2, and were sent by Adams Express to American Graphophone Co., Bridgeport, Conn., November 7, 1894."

Q. 24. Having reference to the three samples sent to the Graphophone Company on October 20, 1894, and referred to in answer to question 15, will you please describe the process followed for making the same ? 1428

A. I dissolved the Stearic Acid, Ozokerite and Oxide of Lead, then added to it the Caustic Soda Lye and boiled the same until I was satisfied that the mixture was anhydrous and finished.

Q. 25. In dissolving the Stearic Acid, Ozokerite and Oxide of Lead did you make use of heat ?

1429

A. I heated the same with a Bunsen Burner, using gas.

Q. 26. In what respects, if any, did the three compositions sent the Graphophone Company on October 20, 1894, differ from the composition described in Mr. Macdonald's letter to you of September 19, 1894?

A. In my compositions I used Stearic Acid in place of Stearine, Oxide of Lead in place of the Acetate, Caustic Soda in Solution in place of the dry form.

1430 Q. 27. And in what respects, if any, did the process followed by you in making these three compositions differ from that described in Mr. Macdonald's letter of September 19, 1894?

A. It differs in that I mixed the metal (oxide of lead) in beginning the operation instead of adding it towards the close.

Q. 28. Having reference to the four compositions sent by you to the Graphophone Company on November 7, 1894, who suggested the use of oxide of aluminum? 1431

A. I cannot say with certainty whether it was my brother or myself. It was one of us.

Q. 29. Do you recall the process followed in connection with the manufacture of these two compositions using oxide of aluminum, and if so, please describe the same?

A. I dissolved the Oxide of Aluminum or more correctly speaking the Hydroxide or Hydrate of Aluminum in the Caustic Soda Lye at the boiling point and 1432 filtered when cold, then added this to the Stearic Acid and Paraffine Wax or Ozokerite and boiled the mixture until the same was finished.

Adjourned until Tuesday Morning, February 13, 1906, at 9:30 A. M.

1433

FEBRUARY 13, 1906, at 9:30 A. M.

The parties met at the hour of adjournment. Present as before.

The witness Adolph Melzer now here desires to add to and supplement to his answer to Question 26, as follows:

My composition also differs from that mentioned by Mr. Macdonald's letters in that it is more acid. That is to say, my composition contained a smaller per centage of caustic soda. The quantity of caustic soda mentioned by Mr. Macdonald, is equal to 10% of the stearic acid employed by him. 1434

I found six to eight per cent to be the minimum and maximum limits, and that it was very difficult to make a cylinder composition with as much as ten per cent caustic soda, figured on basis of stearic acid employed, and still more difficult to mould a composition containing so little free stearic acid.

The atomic weight of stearic acid ($C_{18}H_{36}O_2$) is 284, equiv. 14.08% Na HO, and I found that by using about one half this per cent Na HO (that is by half saponfying the stearic acid the best results were obtained. 1435

> (It is hereby stipulated and agreed by and between counsel for the respective parties hereto that copies of letters and of entries from Mr. Melzer's record book transcribed or to be transcribed upon the record of this case during the taking of the deposition of this witness shall have the same force and effect as the duly proved originals thereof, subject, however, to correction at any time by the originals, by either party, upon reasonable notice). 1436

Q. 30. As I understand the supplement to Question 26, which you have put on the record this morning, with the composition described by Mr. Macdonald in his letter of September 19, 1894, the degree of saponification was somewhat over seventy

1437 per cent. while the compositions first developed by you and sent to the Graphophone Company on October 20, 1894, were saponified to about fifty per cent. In other words, with Mr. McDonald's composition there was somewhat less than thirty per cent. free stearic acid while with your compositions there was about fifty per cent. free stearic acid. Have I correctly understood the situation ?

A. Yes, that is practically correct.

1438 Q. 31. Referring to the two laboratory samples referred to in answer to question 23, what metal was there used.

A. Hydroxide of tin, or hydrate of tin. Staunum is the chemical name for tin.

Q. 32. Regarding the two compositions made on November 4, 1894, using hydrate of aluminum, who suggested the expedient of dissolving the hydrate in the caustic soda lye ?

A. My brother, Charles Melzer. It was, of course,
1439 necessary to dissolve the aluminum and aluminum dissolves readily in fixed alkalis as is well known to chemists.

Q. 33. When the solution of aluminum in caustic soda lye was added to the stearic acid, was the latter melted or not ?

A. Yes, it was melted.

Q. 34. In carrying out the process described in Question 29, when was the paraffine or ozokerite added ?

1440 A. I sometimes introduced it into the vessel at the same time with the stearic acid, at other times I added it later on. The saponification of stearic acid takes place immediately upon the introduction of lye and sometimes the paraffine or ozokerite is added before the introduction of the lye and sometimes afterwards. This is unimportant since the paraffine is not affected in any way by the lye.

Q. 35. Referring to the process described in Question 29, you say that you " boiled the mixture until

1441

the same was finished." What indication was there to determine this point?

A. When the composition stops boiling, that is to say when no more bubbles containing steam rise to the surface, in other words when all moisture has been expelled.

Q. 36. Can you produce a copy of your letter to Mr. Macdonald of November 7, 1894?

A. The letter to Mr. Macdonald referred to is as follows: 1442

"Nov. 7th, 1894.

Mr. T. H. Macdonald,
Bridgeport, Conn.

Dear Sir:

Your favor of the 31st ult. to hand, and we note samples we sent you Oct. 20th are too gummy.

The word "wax" together with the fact that the cylinders should readily take delicate indentations, led us to believe that the composition ought to be hard, yet plastic, and not so brittle like samples you sent us. This fault is easily remedied. We had expected to send you new samples before now, but did not get through with analyses and tests as soon as we had expected. We have now thoroughly exhausted this subject, have experimented with almost every known metal, wax and gum, making up a barrel full of samples, and find only three metals are available for this purpose and of these three, the one represented by samples of Composition D and E sent you by Adams Express today, is in our opinion the best. 1443 1444

The per cent of Ash in D is 7.9, in E 7.8, in your sample marked X 8.6, and in your sample marked D. 14.48%.

Please give samples D and E a thorough

1445

trial, if too gummy or too brittle, we can easily correct this. Awaiting your report, we remain,

Very Respy.,

A. & C. MELZER.

The other two metals are represented in samples sent you Oct. 20th, and in the small samples I & II sent you today with D & E."

1446 Q. 37. What kind of analyses do you refer to in the above letter?

A. A determination of the specific gravity and of the ash contents in the samples sent by Mr. Macdonald.

Q. 38. Why was it that in your letter of November 7, 1894, you referred particularly to samples D and E using aluminum?

A. Because from all appearances so far as we were able to judge this composition was superior to that made with any other metal.

1447 Q. 39. Am I to understand from the reference in your letter of November 7, 1894, relating to your experiments, that the compositions which have been heretofore referred to, and which you mark A, B, C, D, E, 1 and 2, were not all the compositions made between October 15, 1894, and November 4, 1894?

A. I am satisfied that we made a great many more experimental compositions than those you refer to and of which we kept no record for the reason that the substances employed proved unsuitable for the purpose and hence produced a faulty composition. 1448

Q. 40. Will you please produce the original letter of Mr. Macdonald of November 17, 1894, referring to the samples sent the Graphophone Company on November 7, 1894, and read the same on the record?

A.

" Nov. 17, '94.

A. & C. MELZER,
Evansville, Ind.

GENTLEMEN: After using and carefully testing the cylinders made from the materials sent us

1449

by you, we are satisfied that it is all right. It molds readily, is easily shaved and prepared for the record, and the record has good quality being smooth and brilliant. In shaving down the rough mold we found it perhaps a little more brittle than former mixtures, but not enough so to cause any serious inconvenience. I would not be willing to sacrifice any of the good recording qualities for the sake of having it less brittle. 1450

We telegraphed you last Monday to send about 25 lbs. of the mixture so that we could at once mold up a quantity and make a number of records which we can send to our customers. This will be, of course, the best test, as they are the parties who must use them.

If you are satisfied that the mixture will not effloresce or "cloud" in any way, I think we are about ready to complete our work and take the mixture. 1451

If you will kindly send us whatever statement of expenses, etc. that you have incurred, we will take care of the same.

Will it not be well for the writer to go to your factory to thoroughly learn the process of the proper mixing of the materials. We do not want to make any mistake in this particular, of course, and desire the very best results on the start.

Very truly yours, 1452
T. H. Macdonald,
Mgr. Facty."

Q. 41. Will you produce and read on the record a copy of your letter of November 19, 1894, in answer to Mr. Macdonald's letter of November 17, 1894?

A. I do. The letter is as follows:

400

1453

"Nov. 19th, 1894.

Mr. T. H. Macdonald,
Bridgeport, Conn.

Dear Sir:

Your favor of the 17th and telegram of today are at hand. We also received your telegram last Monday, and at once worked up all the stearic acid we had left of the lot purchased for our experiments. It only made about 15 lbs. of
1454 the composition which we expected to send you next day; however, we had a deal of trouble with this lot, and had to work it over at least a dozen times. In place of the handsome white composition we had expected to send you, it is now a kind of salmon color, but otherwise is all right, excepting that it is a trifle basic and shows a tendency to crystallize in center of large cakes. It will not do this in smaller quantity; still, if you should find that your cylinders are
1455 crystalline near center, or should show a disposition to crack you can stop that by adding ¾ to 1 ounce of stearic acid or stearine to every pound of the composition, keeping it at a temperature of 135 to 145° C. and stirring it well for half hour or so (to mix the stearine well before moulding). We note what you say about brittleness of composition, and have used more wax in that sent you today; however, we find that, it is as much an excess of base as a lack of
1456 wax that makes the composition brittle and liable to crack. If you find the composition sent you today, still too brittle, notwithstanding its larger percentage of wax, then add the stearic acid or stearine, as before stated.

It affords us much pleasure and satisfaction to learn that composition sent you worked so well, yet it seems to us that in your desire to get a better material than what you have been using, you are willing to put up with a little unnecessary brittleness &c &c. We don't want you

1457

to do that; after going so far in this matter, let us get it entirely right: we will order today another lot of material, and in the course of next week, and as soon as we have heard from you on the last, will make up and send you a new lot of composition without faults of the last.

As to statement of expenses &c, we fear that,
if we charged you full value for our time, chemicals, materials, expressage, gas, glassware &c
&c, you would be greatly surprised, as these 1458
experiments have taken a great deal more time
than we had any idea. We do not make a business of experimenting for others, anyway, the
subject of making a soap for phonograph cylinders interested us and we went into it without
much regard for the amount of money there
would be in it to us. Let us spend a little more
time on this matter, and when we have made a
complete success of it we hope, in view of the
importance of this matter to you, you can afford 1459
to pay a liberal price for the recipe.

Very Respy.,
A. & C. MELZER."

Q. 42. Do you find any entries in your record book of the five compositions sent Mr. Macdonald on December 3, 1894, and if so, kindly read the same on the record?

> Objected to as irrelevant and immaterial, as stated after Q. 15. 1460

A. The entries are as follows:

> "Dec. 3. During past week have made a number of cylinder compositions for Amer. Graphophone Co. which have been sent to them per Adams Exp. today. Samples are marked *f*, *g*, *h*, *i* & *k*.

1461

Composition as follows :
f. $50\frac{1}{2}$ oz. Stea. Acid.
9 " Paraffine wax.
$10\frac{1}{4}$ " 37° Lye dissolving in this
$\frac{7}{8}$ " Al. Oxide from Penna. Salt Co.
Tempt. 130° C. Color Cream.

g. Was worked over several times. Composition practically same as *f.* Color Salmon.

h. Worked over several times. Composition
1462 same as *f.* and *g.* except $\frac{1}{3}$ ozokerite & $\frac{2}{3}$ paraffine instead all paraffine. Color light brown.

i. 50 Stea Acid.
8 Ozokerite.
1 Al. Oxide (Penna Salt Co) dissolved in
$10\frac{1}{2}$—37° Lye.
Temp. 140°. Color Med. Brown.

k. 50 Stea Acid.
9 Ozokerite.
1 Al. Oxide (Penna Salt Co) dissolved in
1463 11—37° Lye
Temp. 140°. Color dark brown."

Q. 43. Did you write any letter to Mr. Macdonald between November 19, 1894, and December 3, 1894, and if so, kindly state when, and read the same on the record?

A. I find by reference to my copy book that I wrote one on November 21, 1894, the contents of same being as follows :

1464

" Nov. 21st, 1894.

Mr. T. H. Macdonald,
Bridgeport, Conn.

Dear Sir: In filing your letter of 17th we note a passage to which we did not reply in ours of the 19th : Efflorescing of composition. There is no possibility whatever that the second and last lots we sent you will effloresce, and just about one chance in a hundred that the first samples would effloresce in time.

1465

The efflorescence on your composition is due
to a secondary salt (acetate of soda) a product
of the double decomposition that takes place in
making the composition with the materials that
you have employed. This is present in a free
state and shows on surface the same as the carbonate
of soda and chloride of sodium you no
doubt have noticed on old laundry soap.
Another thing that might cause this efflorescence
is the oxidation of the lead; for neither your nor 1466
our compositions are perfect soaps or salts; if
they were, you could not melt and mold them.

The first samples we sent you were likewise
lead soap, but we used a different form of lead
which produced no secondary salt and altogether
made the composition by an entirely different
process from yours. Still, they contain
lead, which is prone to oxidize, and hence there
is just a shadow of liability to effloresce. All
the other samples are made with non-oxidiza- 1467
ble* metals, contain no secondary salts and
hence cannot effloresce.

Very Respy.,
A. & C. MELZER.

* Under ordinary conditions."

Q. 44. When did you next hear from Mr. Macdonald?

A. I received a letter from Mr. Macdonald dated November 23, contents as follows:

1468

" Nov. 23, 1894.

A. & C. MELZER,
Evansville, Ind.

GENTLEMEN: Your recent favors, also sample of wax arrived safely for which please accept our thanks. We have moulded and tested the last batch, and think it fully equal to the former. As to the variation in color, we prefer the last shade sent. It is better for our purpose, 1469 as slight defects on the surface of the cylinder are not so prominent.

It is very urgent that we begin the manufacture of cylinders again as our stock is practically exhausted. We have suspended operations in this dept. pending the results of your experiments and others we have been carrying on ourselves. For other reasons, also, it is urgent that we should settle the matter as soon

1470 as possible. We can begin with what you now have, as the writer is convinced that it is good. In the meantime, if you can better the product I am sure that we would be glad to take that also. In fact we will be glad to have you keep your mind on the subject, as there a number of problems yet to tackle in the business.

We hope that you can put us in the way of commencing work as soon as you can make it possible, as it is necessary for our interests to

1471 begin on something at once.

Very truly,

T. H. Macdonald,

Mgr. Facty."

Q. 45. In sending the Graphophone Company samples *f*, *g*, *h*, *i* and *k* referred to in Question 42, did you write Mr. Macdonald a letter, and if so, kindly read the same on the record?

A. I did, it is as follows:

1472

"Dec. 3d, 1894.

Mr. T. H. Macdonald,
Bridgeport, Conn.

Dear Sir: Yours of 23rd ult. was duly received. You do not say in your letter what would be an improvement of our composition, and hence we had no basis to work on in our endeavor to make it better. However, we have put in this

1473 week making compositions of different degrees of hardness and plasticity, and send you by Adams Express today 5 samples *f*, *g*, *h*, *i* & *k*.

f, *g* and *h* are softer than *i* & *k* and in our opinion would suit best for cylinders that are used but little before being shaved down to take a new record.

i is considerable harder and *k* much more so, and hence would be best adapted for phonograph cylinders that should hold the record a 1474 long time. However, we cannot judge of these matters as well as you can, but might obtain a few pointers, if you will send us a cylinder each of composition *f*, *i* and *k* with record so that we can examine contour of indentations; perhaps it would also be a good idea if you sent us a parlor 'phone to try the cylinders by hearing.

Altogether, we believe little more improvement can be made in the composition by further experiments; however, we want to get them as 1475 perfect as they can be made, but you must point out possible defects.

The samples we sent you, range in color from cream to dark brown; if you want to make your cylinders a uniform color you can melt all the samples together into one, which would produce a composition corresponding very nearly to *h* in every respect; but before you do this (if you do it at all) make for us the three cylinders mentioned above. 1476

Very Respy.,
A. & C. MELZER."

Q. 46. Did you have any correspondence with Mr. Macdonald between this letter of December 3, 1894 and December 31, 1894 ?

A. I find several letters passed between us within the dates stated. My first letter to Mr. Macdonald after December 3 is dated December 9th, the contents are as follows:

1477

"DECEMBER 9, 1894.

MR. T. H. MACDONALD,
Bridgeport, Conn.

DEAR SIR: Your telegram of 8th inst. is just to hand. Our time, labor and materials that we have employed and results obtained in experiments we made for you, are worth at a low estimate $500. Think we can make matters sufficiently plain to you by letter, to make unnecessary a trip to our works. 1478

Very Respy.,
A. & C. MELZER."

Q. 47. Did Mr. Macdonald reply to the above letter, and if so, kindly read his answer on the record?
A. He did, and it is as follows:

"DEC. 13, '94.

1479 A. & C. MELZER,
Evansville, Ind.

GENTLEMEN: Our General Manager was suddenly called away before I received your last letter and so I have been unable to lay the matter contained therein before him.

It strikes me that the figure you have named, $500. is pretty high. Can't you review the matter and give us a little better figure? We find it pretty hard to struggle up with a new 1480 business on our hands, and $500. in one lump is pretty large to us. We have quite a number of other problems for your consideration, the principal one being a soap that will be sufficiently tough to go on a paper base, and yet give a good record. This is for use as a mailing cylinder. These would necessitate further expense, of course, and altogether will make quite an expense for us.

Could you give us an idea of what the soap would cost per lb.

1481

Also, will you be willing to make it up for us, for a time, and sell it at so much per lb.?

The records made on the last lot are very fine. I send you samples of each as requested.

Many thanks for the box of soap. Mrs. Macdonald states that it is the best she has ever had, and is more than pleased.

Very Sincerely,
T. H. Macdonald,
Mgr. Facty." 1482

Q. 48. What reply, if any, did you make to Mr. Macdonald's letter of December 13th?

A. I replied as follows:

Dec. 18th, 1894.

Mr. T. H. Macdonald,
Bridgeport, Conn.

Dear Sir: Yours of the 13th received two days ago, but the cylinders have not arrived up 1483 to this writing. You do not mention *how* they were sent.

It is improbable that you could find another person both competent and willing to undertake the work we have done for you, particularly upon the terms, "no success, no pay". We have worked diligently on that composition for 60 days, including nights and Sundays, and believe we named a low figure for this. Our time, employed in our regular business brings us a 1484 great deal more, and special work, particularly when attended by success, ought to pay still better. We have two or three problems to solve in our own business, and would cheerfully give $500. for the solution of any one of these, regardless whether it took the party half hour or half a year to work it out; but alas, the information is not obtainable at any price. Rather than accept one cent less than amount named, we should prefer to take no money at all. Send

1485 us a nice graphophone for our parlor and we will tell you how to make the composition for your cylinders.

Cost of the composition for materials, is about 12c. lb. We could not undertake to make it for you, for, although we have every facility, apparatus and machine for making soap, we are not fixed for making the composition except on small scale in our laboratory. Our steam pressure is 95 lbs.; 1486 the temperature of this is not high enough to boil the composition, and to put up a superheater, or kettles heated by gas (open fire is not sufficiently controllable) would probably not justify.

Regarding soap for mailing-cylinder, would say, we will undertake the job, but expect fair compensation for our time. What an expert or specialist in any branch of business is paid for important work you very probably know. In 1487 this connection, would say that, when we undertook experiments now finished for you, we were under impression that your Co. must necessarily be a large and long established one, Mr. Bell of telephone fame being at the head, and that an improvement in composition for his cylinders would be duly appreciated. We now see there are more than one Mr. Bell in the phone business, and as it is always more satisfactory to know something about the people we have business 1488 with we would thank you for a brief statement or reference.

As to ourselves, we refer you to any bank or merchant in our city, or to Mr. Henry F. Blount of Washington, where we see you have an office. We know no one in Bridgeport.

We should think a narrow ribbon of paper, covered with a suitable composition for taking records, would be a very valuable thing. This ribbon could be rolled up like ordinary tape, placed in a suitable mailing tube or box and

1489 sent through the mails at ordinary letter postage. Of course, the tape would have to be as cheap as writing paper.

Very Respy.

A. & C. MELZER."

Q. 49. When did you next hear from Mr. Macdonald?

A. Another letter is dated December 22, 1894, as follows:

"BRIDGEPORT, CONN., 12/22/94. 1490

A. & C. MELZER,
Evansville, Ind.

GENTLEMEN:

Your favor received. I regret that there should be any misconception in this matter of cylinder material. I thoroughly appreciate your work on the cylinder, and consider it first class in every way.

1491 Perhaps I should have explained the precise position I am in in regard to the Cylinder matter before writing the last letter.

I worked out the formula I sent you which makes the wax that 'sweats' some time ago. At that time the company were using the soft ozokerite cylinder for commercial purposes, and were buying phonograph cylinders for the purpose of finer work. When I got the acetate of lead mixture I thought that I had something that was equally good. And, to make it short, 1492 I was given a contract by the company to make the cylinders, provided that I could give them a cylinder for musical purposes that would be equally good. I thought that I could do so, and commenced work. The sweating did not develop for some time, not until a large number had been made and sold. As soon as it did the cylinders began to come back. Of course this stopped further work on my contract. I was then in the position where I must at once fur-

1493 nish good cylinder material or pay for the
damage. When I telegraphed to you I had just
been formally notified under the terms of the
contract that I would be obliged to furnish a
suitable wax by January 1st next or have the
contract cancelled and pay the damage resulting
from the loss of music and other records placed
on the soft cylinders.

The loss has already been considerable, and may
1494 be more. I think that the composition that
you have sent will do the work, and to say that
I appreciate your work is to say but very little
of what I feel. I most gladly accept your offer
to receive one of our machines in payment. I
am sending you to-day one of our most complete
outfits. I enclose with this a number of the
cylinders which I have made up from time to
time on your compound. These I have marked
so that you will know them. Also send the
1495 cylinders made from the last mixtures that you
sent. I found on investigation that these had
not been sent as I wrote, and so I send them
now.

I shall take pleasure in sending you from
time to time all the best and latest records of
music, etc. that we make.

The Chas. J. Bell who appears as our president
is a well known Washington banker, and a
nephew of Alexander Graham Bell of telephone
1496 fame. Gardiner G. Hubbard, the second
director as appears above is the father-in-law
of A. G. Bell. Mr. W. E. Bond is the financial
agent of the Wm Walter Phelps estate in New
York, and Mr. J. J. Phelps is also one of our
directors now. We can refer you to any of the
Washington banks for further reference.

I send full directions with the machine and
have tagged the different parts so that there
will be no difficulty in using the same.

We have none of the parlor cabinets now in stock, so I send the machine in a small case. We will send you one of them as soon as they are finished and you can then place the machine in it. 1497

Machine goes by Adams Express prepaid.

In regard to your suggestion of a mailing cylinder. The great objection to the method you suggest, that of a paper ribbon, is that it would take such a great length to get any record of account. The surface speed of the cylinder 1498 must be at least 55 feet per minute to get good results. So you see that to get a record of five minutes it would be necessary to have about 275 feet of tape. Another great objection is that you could not go back and take a portion over again.

I send you inclosed with machine a sample of our ozokerite mailing cylinder. The mailing cylinder should be a little smaller than this, but should be made the same way, that is a paper 1499 tube covered with a wax that will take a good record. This cylinder cannot be used on the machine that I send you.

Of course anything done in the line of a mailing cylinder would be done for the company, and you will be properly compensated therefor.

Hoping that this explanation will be satisfactory, I remain

Yours sincerely,
T. H. Macdonald, 1500
Mgr. Facty."

The witness desires to state that he would have withheld that portion of this letter which relates to the financial condition of the American Graphophone Co. but consented that it be put upon the record in as much as no objection to doing so was raised by counsel for either of the parties.

Q. 50. Did you make any reply to Mr. Macdonald's

418

1501 letter of December 22, 1894, and if so, kindly read the same on the record?

A. I replied to Mr. Macdonald on December 26th, 1894, as follows:

" DECEMBER 26, 1894.

MR. T. H. MACDONALD,
Bridgeport, Conn.

DEAR SIR:

1502 Your favor of 22nd is just to hand, but the 'phone has not yet arrived.

The information regarding the members of your Co. and your own position in matter of cylinder material is very interesting, and removes all distrust.

You can assure your Co. that, very soon after January 1st you will be in position to supply cylinders that will be eminently satisfactory in every respect. We will send you tomorrow by

1503 Adams Express, the recipe with detailed instructions, notes, samples of the materials, addresses, and 2 or 3 samples of standard composition, and if you will carefully follow our instructions, you will have no trouble making the composition, and should any occur, nevertheless, then write to us or make us a visit and see us make it.

We see from your letter that your Co. have been buying the cylinders for fine work. We did not know that they were purchasable, but

1504 now remember that you said of sample X, it gives entire satisfaction but you do not know how it is made. Is this the material you have been buying, and may we know of whom and at what cost?

We have just read an article in yesterday's Cincinnati 'Commercial Gazette' regarding your Co's suit against Mr. Edison. We congratulate you upon your success, but do not mean to say by this, that, we rejoice in Mr. Edison's defeat. It is always regrettable to see two good men ap-

1505 peal to the Courts for protection against one another.

We glean from this newspaper article that your Co. claims the record is *engraved* on their cylinders, whilst in the Edison system it is indented. Now, this is something you did not tell us in any of your letters and we were of the opinion up to this time, as you can readily see from contents of our letters, that the recording tool *indents* the record on your cylinders, and 1506 hence we believe that the composition (or *Wax* as you call it) should be reasonably hard but yet *plastic*, and not *brittle*; for we could not see how a hard and brittle material that is to crumble into powder under pressure of the fingers could take the *indentations*. Of course, a material for engraving, and a wax to be indented, are two very different things.

If convenient, please send us a complete report of that suit. 1507

Very Respy.,
A. & C. MELZER."

Q. 51. When did you next write Mr. Macdonald, and kindly read the letter on record?

A. I next wrote to Mr. Macdonald under date of December 31st, as follows:

" EVANSVILLE, Ind., Dec. 31, 1894.

MR. T. H. MACDONALD, 1508
Bridgeport, Conn.

DEAR SIR: Your favor of 26th and the two boxes, graphophone and battery arrived last Saturday. Everything opened up all right and we kept that "Phone" humming the greatest part of the day yesterday. Please accept our best thanks; we are almost glad now you did not send us a check, for we can now understand your needs a great deal better, and whilst we will make no promises, think we can make

1509 further improvements in the cylinder composition and will continue our experiments. We fail to find any cylinders made from composition we sent you, also the mailing cylinder you mentioned in your letter. Of course, we would like to see and hear a cylinder made from our own composition, but will not press this matter any further.

We were delayed in getting ready the standard
1510 samples we wished to send you with recipe. Cause was that the composition seemed entirely too brittle and hence we remelted it several times, and tried what might be termed a process of annealing and in the case of brown sample we increased the ozokerite up to 25% of the Stearic Acid. All this did not change nature of the composition much, and if you find comp. too brittle, then reduce proportion of the metal base as fully explained in recipe. In warm
1511 weather, composition would not behave so brittle as in cold. Do you hear no complaints about your graphophone cylinders cracking? Soon after arrival we opened the wood box and took out one of the graphophone cylinders, while we were holding it in the hand, looking at it, it suddenly snapped, cracking in 3 or 4 places. It seems the cylinder was rather cold and taking it out and holding it in the warm hand caused the outside of it to expand and
1512 crack. We send this cylinder back to you for your information.

We have sent you by Adams Express to-day a box containing samples of composition, materials used for same, and a few pieces of glassware that you might not be able to obtain conveniently in your city.

In one of the boxes of toilet soap you will find a little red book containing recipe and full directions for making the composition; also all other information that we believe you might

1513 need. Follow our directions conscientiously and you will have no trouble, we think; if nevertheless any difficulty should occur, we are at your service.

The other box we send you to-day contains a bottle of $37\frac{1}{2}°$ Caustic Soda Lye, enough for 50 lbs. or more of composition. We forgot to tag the bottle; please do this for us to avoid possible accident.

With the compliments of the season, we remain, 1514

Very Respy.,
A. & C. MELZER."

(Counsel for defendant here gives to counsel for complainant notice to produce the "little red book containing the recipe and full directions for making the composition, etc." referred to in the above letter of Dec. 31, 1894, and now in the possession of the complainant.)

1515

Adjourned until Wednesday, Feb. 14, 1906, at 9:30 A. M.

WEDNESDAY, February 14, 1906.

Met pursuant to adjournment.

Present, same as before. 1516

Q. 52. Having reference to the "little red book" sent by you to Mr. Macdonald on December 31, 1894, upon what did you base the recipe and directions for making the composition you referred to therein?

A. Upon the experience in general gained during the time I made these experiments and concentrated into what I considered the best formulas recorded in my record book, page 15.

Q. 53. Kindly quote on the record the entries on

1517 page 15 of your record book to which you refer in your last answer.

> Objected to as irrelevant and immaterial and as incompetent for the reasons stated after Q. 15.

A.

"1894.

1518 Dec. 26. Made on Cook Stove, Comp. for graphophone cylinders, as follows:

"1"

50 oz. Stearic Acid.
9 " Paraffine Wax 133–136°
10¼ " 37° Lye, dissolving in same (boiling)
⅞ " Hydr. of Aluminum (Penna Salt Mfg. Co.)
Time, 2 hours, temp.
1519 90° to 130° C.

51 Stea Acid.
10⅝ 37° Lye
9 Paraffine Wax
⅞ Hydrate of Al.

light foam remaining on top. Color light cream.

Slightly crystalline.

Added ½ oz. Stearic Acid. Very crystalline.

Dissolved and cooled down to 115°. No change.

Added ⅜ oz. 37° Lye. Better; slightly crystalline.

1520 Dissolved, adding ½ oz. Stea. Acid.

Now all right. Marked '*l*' and put away in glass case of laboratory.

27. Made on Cook Stove. Comp. as follows.

"m"

50 oz. Stearic Acid.
9 " Ozokerite.
⅞ " Hydrate of Aluminum, dissolved in 10½ oz. 37° Lye.
Highest temp. 150° C.
Left to cool at 130°.

51 oz. Stea. Acid.
11 " 37° Lye
12½ " Ozokerite
⅞ " Hydr. of Aluminum.

1521

28. Crystalline in center. Dissolved, adding ½ oz. Stea. Acid.
Again crystalline; dissolved, adding ½ oz. Stearic Acid.
More crystalline; dissolved, adding ½ oz. 37° Lye.
Now all right, but extremely hard & brittle.
29. Dissolved adding 3½ oz. Ozokerite.
30. O. K. in every way, except brittle still." 1522

NOTE—These samples were sent by Adams Express to Amer. Graphophone Co. Dec. 31/94.

Q. 54. What do the figures 27, 28, 29 and 30 in connection with composition "m" refer to?

A. That is the date of the month when these corrections of composition "m" were made.

Q. 55. As I understand it then composition "l" was made on Dec. 26, 1894, and composition "m" was made on Dec. 27, 28 and 30, 1894?

A. Your understanding of the dates is correct. 1523

Q. 56. In connection with these two compositions "l" and "m" I observe that two formulas are given in each case, one, for example, mentioning 50 oz. Stearic Acid, and the other, at the right of the entry, mentioniag 51 oz. of Stearic Acid. What is the significance of this?

A. It is plain from my entries in record book that I started these experimental compositions with a charge of even 50 oz. Stearic Acid, but found it necessary in correcting certain small defects in the resulting com- 1524
positions to add some Stearic Acid, increasing the total quantity of Stearic Acid employed to 51 oz. as fully explained in the entries. For the sake of convenience I summed up the materials originally employed with the quantities added in course of making the composition and made a marginal note of the totals on the right of the entries.

Q. 57. In making compositions "l" and "m" what process was followed?

A. I dissolved the Stearic Acid and Paraffine Wax

1525 in an enameled kettle heated by a Bunsen Gas Burner and added to this gradually the Caustic Soda Lye in which the Hydrate of Aluminum had been previously dissolved. Then boiled the composition until all ebulition had ceased indicating that all moisture had been expelled and that the composition was finished. This required about two hours and the temperature ranged between 90° C in the start to 130° C when finished.

Q. 58. Do you use the word dissolved in your last
1526 answer as synonymous with melted?

A. Yes; I prefer to use the word dissolve for the reason that it explains more correctly the operations in our line of business than the world melt.

Q. 59. Referring to compositions "*l*" and "*m*" in what sense did you use the words "dissolved" and "dissolving" in describing the action which took place when the Hydrate of Aluminum was added to the boiling Caustic Soda Lye?

A. To express the action that takes place when a
1527 soluble substance is brought into contact or mixed with a liquid in which that substance is soluble, as for instance when sugar is dissolved in hot water or coffee.

Q. 60. Do you observe any connection with the formula of composition "*l*" as finally corrected, and formula "*A*" of the Macdonald patent in suit to which your attention has been drawn?

Objected to as calling for a conclusion.

1528

A. The figures of formula for my composition marked "*l*," multipled by the figure eight (8) are identical with the figures given in formula "*A*" of Mr. Macdonald's patent.

Q. 61. I observe that in your note book, referring to composition "*l*" and "*m*" you allude to "37° Lye," while in your letter to Mr. Macdonald of December 31, 1894, you refer to "37½° Caustic Soda Lye." Is this variation material, and can you explain the same?

A. In explanation of the discrepancy you mention,

1529
would say, the strength of alkaline solutions, is
determined conveniently but not absolutely correctly
by means of the well known glass instrument, the
hydrometer. The hydrometer ordinarily employed by
soap makers (and it was such a one I used in the
experiments) is graduated from 0 to 50° upon a glass
tube about five inches in length, thus allowing less
than $\frac{1}{8}$ inch for each degree of strength. Lack of care
in introducing the hydrometer into the liquid to be
tested, the position of the observer in reading the 1530
hydrometer, capillary attraction and variations in the
temperature of the liquid, may easily lead to a difference
of $\frac{1}{2}$ to 1° in the reading, the same as in reading
a thermometer. I presume that, when I made the
experiments under consideration, I believed the lye
employed marked 37° on the hydrometer, but in verifying
this figure before writing to Mr. Macdonald and
sending the formula, I again tested the lye with the
hydrometer and now found that its strength was more
nearly or quite 37$\frac{1}{2}$° and hence adopted the latter 1531
figure.

Altogether, the $\frac{1}{2}$° of 37° lye is insignificant, and equally good cylinder compositions may vary very much more in caustic soda content than the quantity represented by $\frac{1}{2}$° in the strength of the lye employed.

In a former answer I stated that the minimum and
maximum limits of caustic soda for cylinder composition
lies between 6 and 8% of the stearic acid employed.
This is equal to 25% of the caustic soda.
(See answer to Q 29 on Feb. 13, 1906.) 1532

I wish to state that when I speak of "lye", specifying no particular kind, I always refer to Caustic Soda Lye, or in other words, to a solution of caustic soda in water.

Q. 62. In the Macdonald patent in suit Mr. Macdonald in the first claim thereof claims a process of making a sound recording material by dissolving aluminum in soda lye and adding the solution to stearic acid. Assuming the word aluminum to comprehend hydrate of aluminum how would such a process as

1533 thus claimed compare with the process as set forth in your note book and given in answer to Question 53, as well as with the process described in the "little red book" which you sent Mr. Macdonald on December 31, 1894?

Objected to as calling for a conclusion.

A. I should say that it is practically identical.

1534 Q. 63. Without asking you a similar question as to all the claims of the patent in suit I direct your attention to that part of the Macdonald patent relating to "Formula A," page 2, lines 35 to 59, inclusive, and ask how the process and composition as practiced by you compared with this description?

Objected to as calling for a conclusion.

A. I should say that it is practically identical.

1535 Q. 64. And how did the process and formula as communicated by you to Mr. Macdonald in "the little red book" sent him on December 31, 1894, or in any other way prior to that date compare with this description of the patent in suit?

Objected to as calling for a conclusion, and further objected to as without sufficient basis it not appearing what was in the little red book.

A. I can only repeat the previous answers, it is
1536 practically identical.

Q. 65. In the patent in suit Mr. Macdonald states that before the hydrate of aluminum or aluminic hydrate is added to the lye of caustic soda in water, the lye "is heated to its boiling point, about 242° fahrenheit." Was this your practice and was it disclosed to Mr. Macdonald or not in the "little red book," or otherwise, before December 31, 1894?

A. To dissolve the hydrate of aluminum in the caustic soda lye it is not necessary to bring the lye to the boiling point before introducing the hydrate of

1537

aluminum. It may be added to the lye at any temperature. The essential point being that the lye is brought to the boiling point after the hydrate has been added to it in order that the hydrate may be completely dissolved. I cannot recall whether in my recipe "in the little red book" I directed that the lye be brought to the boiling point before introduction of the hydrate, or not. I tried to make my directions as simple and plain as possible in order to avoid their 1538
being misunderstood by Mr. Macdonald.

Q. 66. In communicating the process and composition to Mr. Macdonald did you explain to him the necessity of bringing the caustic lye to the boiling point either before or after the introduction of the hydrate of aluminum?

A. Probably I did, but having no copy of the directions given him in the little red book I cannot state with certainty.

Q. 67. What would be the ordinary chemical prac- 1539
tice in dissolving hydrate in caustic soda lye?

A. Add the hydrate to the lye, bring it to the boiling point and keep it at that for a few minutes.

Q. 68. When hydrate of aluminum is added to caustic soda lye what is the resulting solution. That is to say, what is its chemical name?

A. Depending upon the proportions of alumina and caustic soda, it is more or less an aluminate of soda.

Q. 69. In the patent in suit Mr. Macdonald states
that the "stearic acid is melted and raised to about 1540
the same temperature *(i. e.* 242° fahrenheit) and the compound of lye and aluminum added slowly thereto." What was your practice in this respect and do you recall the extent of your communication to Mr. Macdonald on this point. Also state whether the temperature of the stearic acid when the solution is added is material?

A. In practice I found, that if the lye is added to the stearic acid when the same (the stearic acid) is at a low temperature there is a liability of the formation

1541 of lumps of basic soap which are difficult to dissolve during the process of making the composition; for that reason I preferred to add the lye slowly to the stearic acid when the same had reached a comparatively high temperature. At the same time stirring the composition actively, in order to disseminate the lye thoroughly throughout the mass. I think this was explained to Mr. Macdonald in the little red book; probably
1542 not in so many words, and perhaps I confined my directions to advising him to add the lye after stearic acid had reached a reasonably high temperature.

Q. 70. The patent states that after the solution has been added to the stearic acid the "temperature may subsequently be raised to about 300° fahrenheit and continued at that heat until the water is all expelled." What was your practice in this respect and do you recall the extent of your communication to Mr. Macdonald on this point?

1543 A. In my experiments I employed temperatures ranging from 130 to 180° C and it is my impression that Mr. Macdonald understood this part of the operation in making cylinder compositions and that no special directions were necessary.

Q. 71. In the patent in suit Mr. Macdonald makes the following observations, "The composition, however, differs from ordinary soap in that it contains no oleates, I having found that the presence of even a small quanity of oleate or oleic is detrimental. It is
1544 also important that the tallow or other source from which the stearic acid is obtained be completely deglycerinized. Except under these conditions the result will be unsatisfactory" (Page 1, lines 85-93). What observations, if any, have you to make as to these statements?

Objected to as immaterial.

A. These observations of Mr. Macdonald's are quite true and will probably be found recorded in the little

1545 red book. However commercial stearic acid free from oleic acid and undecomposed fats, does not exist, and we must therefore be content with stearic acid approaching to that quality recommended by Mr. Macdonald. The ordinary commercial stearic acid contains at least 5% of undecomposed fats and probably an equal quantity of oleic—this is a rough estimate.

Q. 72. What would be the effect on the cylinder composition if the stearic acid contains an undesirably high amount of oleic acid or undecomposed fats or 1546
both?

A. As only half or about half of the stearic and oleic acid, and none of the neutral fats in the composition is saponified, the free oleic acid and the neutral fats in the composition will in time appear in the form of an exudation, commonly known as "sweating" on the surface of the cylinders. This answer applies to the conditions stated in your question.

Q. 73. Having reference to the formula set forth in answer to Question 53 and communicated to Mr. Mac- 1547
donald on Dec. 31, 1894, can you state what the extent of saponification of the stearic acid was?

A. About forty-six per cent. (46%).

Q. 74. Can you produce a letter from Mr. Macdonald to which yours of Dec. 31, 1894, was in answer, and if so, please quote on the record any statements responding to your questions in your letter of December 26, 1894, on the subject of phonograph cylinders?

A. The letter you refer to is dated Dec. 28, 1894,
and does not refer to the subject at issue excepting 1548
the following paragraph: "The phonograph factory is closed now, that is as far as new machines are concerned. They are only doing repair work and furnishing extras.

"The cylinders for phonographs are made by a separate Co. and sold to the North American Phonograph Co. or to the Receiver now. The people who make them, do so after a secret process, so rumor says, that was devised by a Belgian soap chemist. Our Co. has paid as high as 15c. each for the finished blank. The lowest they ever paid was 11c. each."

1549 Q. 75. When did Mr. Macdonald reply to your letter of Dec. 31, 1894, and kindly read his answer on the record?

A. He replied on January 3, 1895, the letter being as follows:

"JANY. 3, '95.

A. & C. MELZER,
Evansville, Ind.

1550 GENTLEMEN: Your esteemed favors, also the two boxes containing samples, etc. received.

I hardly know what to say to fully express my appreciation of your most excellent work in our behalf. I certainly hope that I will be able to fully compensate you in the future, if not in other ways, at least by keeping you well in touch with all that is interesting in Graphophone business.

You must pardon me for the apparently inex-
1551 plicable delay in sending you cylinders of your
own composition. I have delayed the sending
for the purpose of getting some good records on
them. I have been heels over head at work on
a new duplicating machine, or rather *a* duplicat-
ing machine as there are none now in existence.
That is a machine that will duplicate cylinders
from one original master record. I think I have
succeeded, and will let you be among the first
1552 judges of the measure of success attained. I
send you, at last, by Adams a box containing a
number of records on the various cylinders made
from your material. Also duplicates on cyl-
inders purchased from the Phonograph Co.

In my opinion your mixtures, with the possible exception of the first samples, are fully the equal of anything ever turned out by the phonograph Co. and *several samples I consider infinitely superior to them.* There is to me a *virility*, a *brilliancy* in the record that those on phono. cylinders do not possess.

1553 I have been going carefully over your directions for the mixture, and will, tomorrow, make my first essay at a mixture.

What was the difference between the last five
samples sent? That is *f, g, h, i and k?* They
all seem good and it is really difficult to say
which is the best. I think that *i* or *k* would be
the best for us on account of color. Small defects of every description show up too plainly
on a white cylinder. 1554

Now in regard to purchase of Stearic Acid, I
have this material, purchased from A. Gross &
Co. candle mfrs of No. 75 Warren St. N. Y.
They called it "Adamantine Stock, first-run
distilled, with 5% Paraffine added." It is apparently very close to that you sent as sample,
except that it is of whiter material. According
to your formula, 51 oz. St. Ac. to 9 oz. Paraffine,
you use 17.65% paraffine. Now couldn't I
merely add 12.65 lbs. paraffine to 105 lbs. of 1555
this St. Acid, thus giving me a mixture of
17.65% paraffine?

I have Greenbanks Alkali in 10 lbs. cans guaranteed 98% pure. I buy it from the Troy Laundry Machine Co. of 15 Murray St. New York, at 8c. per lb. It is powdered and very convenient. Will this do all right?

I will make up some cylinders from my attempts as soon as they are complete.

Can the Lye and Hydrate Alumina be mixed 1556
then and set aside for use in carboys?

Again thanking you for the many favors received I remain,

Sincerely yours,
T. H. MACDONALD."

Objected to as irrelevant and immaterial and motion to strike out.

Adjourned until Thursday Morning, Feb. 15, at 9:30 A. M.

1557

FEBRUARY 15, 1906.

Met pursuant to adjournment.

Present as before.

Q. 76. Will you please produce all the letters received by you from Mr. T. H. Macdonald subsequent to 1894; and also copies of all letters written by you to him (of which you have retained copies) during the
1558 same period?

A. In addition to the letters already produced and copied into the record I now produce fifty-three (53) letters received by me from Mr. Macdoland and copies of thirty-four letters written by me to Mr. Macdonald during the period mentioned.

Some of the letters and copies of letters produced by the witness appearing to be of no special importance it is agreed by counsel for
1559 the respective parties that the following selected letters of Mr. Macdonald, or parts thereof, *i. e.* those dated,

Jan. 8, 1895,
Jan. 18, 1895,
Jan. 25, 1895,
Jan. 31, 1895,
Feb. 2, 1895,
Feb. 24, 1895,
Mar. 14, 1895,
1560 Mar. 29, 1895,
April 8, 1895,
April 12, 1895,
May 26, 1895,
June 22, 1895,
July 2, 1895,
Aug. 11, 1895,
Dec. 21, 1895,
Sept. 3, 1896,
Sep. 21, 1896,
Oct. 6, 1896,

1561
Oct. 17, 1896,
April 17, 1897,
June 20, 1897,
and the copies of the following letters of Mr. Melzer, *i. e.* those dated
Jan. 9, 1895,
Jan. 10, 1895,
Jan. 25, 1895,
Jan. 29, 1895,
Jan. 31, 1895, 1562
March 31, 1895,
April 1, 1895,
April 3, 1895,
April 14, 1895,
April 18, 1895,
June 30, 1895,
Sept. 9, 1896,
Sept. 30, 1896,
Oct. 16, 1896,
April 11, 1897. 1563
may be and the same are hereby offered in evidence by counsel for the defendant and marked, "Defendant's Exhibit, Selected portions of Macdonald-Melzer Correspondence."

Q. 77. State whether or not the originals of your letters to Mr. Macdonald, copies of which you have produced, were mailed to Mr. Macdonald in due course at or about their respective dates?

A. Certainly. 1564

Q. 78. In the practical working of the process involving the use of either of the formulæ found on page 15, of your record book. what were the relative temperatures of the stearic acid and of the alkaline solution containing aluminum dissolved therein, when these elements were combined?

A. The relative temperature of these materials when being mixed is not essential. I always filtered the caustic soda solution containing the alumina before using it, and consequently this solution was cold and in

1565 this condition I would add it to the hot stearic acid. I more broadly stated this in a previous answer.

Q. 79. Was or was not the temperature raised after the alkaline solution containing aluminum was combined with the stearic acid?

A. The temperature of the composition is raised progressively after addition of the caustic soda solution. This in part by the chemical action of the caustic soda (a base) upon stearic acid, but principally by the fire under the kettle. 1566

Q. 80. If the temperature were raised after the alkaline solution containing aluminum was combined with the stearic acid what effect had this rise of temperature upon the composition, if any?

A. The object of increasing the temperature of the composition is, first, to drive off the water it contains, also any volatile acids and light hydro carbons, and, second, to bring the composition to the proper limpid condition necessary for molding it into cylinders.

1567 Q. 81. Was the tempering wax, such as paraffine, etc., added before or after the mixing of the alkaline solution containing aluminum dissolved therein with the stearic acid?

A. I sometimes added the paraffine wax at the beginning of the operation, sometimes later on. Altogether, I prefer to add the paraffine wax in the beginning, for the reason that it will then be subjected to heat a longer time, and any light hydro carbons it might contain would then be more likely to be expelled by the heat. 1568 Light hydro carbons in the composition are objectionable.

Q. 82. How much of the cylinder composition prepared according to either of the formulæ entered on page 15 of your record book did you ever make at any one time at your laboratory at Evansville?

A. Up to December 30, 1894, I had not made more than about four (4) pounds of the composition in any one experiment, but had made a great many of these experiments, possibly a hundred. Some were recorded in my record book, others that proved failures were not.

1569

Q. 83. How large a batch of such composition material did you make or cause to be made at the American Graphophone Co.'s factory at Bridgeport, Conn.?

A. The charges were three hundred (300) pounds and three hundred and fifty (350) pounds stearic acid, and other ingredients in their proper proportion.

I take this from my record book and from the entries dated July 23rd and 25th, 1895.

Q. 84. I notice that in Mr. Macdonald's letters to
you he many times refers to difficulty with "pin holes" 1570
as he calls them, formed in the composition produced
by him pursuant to your formulæ. Will you please
explain what caused this difficulty and when, and how,
if in any way, it was remedied by you?

A. The "pin holes" complained of by Mr. Mac-
donald were evidently caused by the lack of care in the
manipulations of molding these cylinders. I found the
conditions under which Mr. Macdonald worked rather
primitive. The vessels used for pouring liquid com-
position were open tin vessels which discharged their 1571
contents from the top, thus permitting all air bubbles
of which there are generally more or less on the sur-
face, to run into the molds, there to be arrested in the
congealing mass to form flaws, "pin holes." In place
of the tin vessels or dippers discharging from the top I
ordered and used tin vessels having a spout starting
from near the bottom of the vessel, same as in the case
of the ordinary tea-pot; by employing these vessels
which took the liquid composition from near the bot-
tom of the vessel where it was free from air bubbles 1572
and by using proper care in general in the manipula-
tions of molding, the "pin holes" were eliminated
almost entirely.

Q. 85. When and under what circumstances did you first learn that Mr. Macdonald claimed to be the inventor of the composition and process of producing the same set forth in the specifications and claims of the patent here in suit?

A. I learned of it through the list of patents issued, and published weekly in the "Scientific American".

1573

To keep posted on all inventions in my own business (soap making) also in that of talking machines, and particularly in cylinder compositions in which I took a lively interest, I was and am in the habit of sending to the Patent Office for the patent specifications of new inventions in these lines. Thus, I also sent for the specification of Mr. Macdonald's patent, which I received shortly after date of its issue.

Q. 86. Had you or not any intimation of Mr. Mac-
1574 donald's claim to inventorship of the subject matter of that patent before that time.

A. I had not.

Q. 87. Was or was it not a matter of surprise to you that he should have made such a claim ?

Objected to as irrelevant and immaterial.

A. It rather was.

Q. 88. Did you or not ever acknowledge to Mr. Mac-
1575 donald, or to any one, that the composition or process, or both, described and claimed in the Macdonald patent in suit was the invention of Mr. Macdonald ?

A. I did not.

Q. 89. Did you ever remonstrate with Mr. Macdonald orally or in writing for having taken the patent in suit without your knowledge ; and if not, why not ?

Same objections.

1576 A. I did not ; I was willing that he should have all the benefits from that invention, but felt that he did wrong in taking out that patent and bodily claiming our (my brother's and my) formulas and process for the composition as his own without consulting us and obtaining our consent.

Q. 90. State whether or not your relations with Mr. Macdonald were friendly or otherwise between the time of your first acquaintance with him in 1894, and the issue of the patent in suit to him in July, 1898 ?

A. They were generally friendly.

1577

Q. 91. I note among the papers submitted for the inspection of counsel what purports to be an agreement, dated August 7, 1895, signed by you and Mr. Macdonald, which I would like to have extended in the record. Will you please permit this to be done?

A. Yes.

(By consent of counsel the agreement is copied in the Record as follows):

"Grand Union Hotel, 1578
Opposite Grand Central Station.
FORD & COMPANY,
Proprietors.

NEW YORK, Aug. 7", 1895.

By mutual agreement between A. Melzer of the first part, acting for A. & C. Melzer, of Evansville, Ind., and T. H. Macdonald, of the second part, acting for the American Graphophone Co., of Bridgeport, Conn., it is agreed that, 1579 all services rendered by the said A. & C. Melzer from Oct., 1894, to date, to the Amer. Graphophone Co. in improvement of a certain composition for graphophone or phonograph cylinders, is settled for and paid by the several graphophones, parts of graphophones, records and sundries, delivered to the said first party by the second party up to date, and that a certain check for $75.00 dated Aug. 2nd, 1895, signed by the party of the second part and payable to A. 1580 Melzer is to be considered as payment in full for the said A. Melzer's traveling expenses to Bridgeport, Conn., in the interest of the Amer. Graphophone Co.

A. MELZER,
T. H. MACDONALD.

Duplicate."

Q. 92. In whose hand writing is this agreement and whose signatures are appended thereto, if you know?

1581 A. The hand writing is mine and the signatures are mine and that of Mr. T. H. Macdonald.

Q. 93. Will you please explain how this agreement came to be made?

Objected to as immaterial and irrelevant.

A. The paper you refer to is really a receipt which I wished to possess in order to show that I had given to
1582 the American Graphophone Co. an equivalent for the machines and parts of the machines sent me by Mr. Macdonald. I did this to avoid any possible claim the American Graphophone Company might subsequently make upon me for the payment of those machines, parts of machines, records and sundries.

Q. 94. I also notice among your papers exhibited to counsel a letter from Mr. Easton, President of the American Graphophone Co., to you. Will you please produce the same and permit it to be copied into the
1583 record?

A. I produce the same and the examiner will please copy the same in the Record:

"1159 Broadway, N. Y. City,
July 28th, 1896.

Mr. A. Melzer,
Evansville, Ind.

Dictated to the Graphophone.

Dear Sir:—

1584 We have report that you are making Graphophone cylinders for sale; but doubt this, and therefore, as a matter of courtesy, write directly to you, to ask if you will kindly tell us what are the facts.

Yours truly,
E. D. Easton,
President.

Q. 95. If you made a reply to this letter and have preserved a copy of the same will you please read it to the examiner?

1585

A. I did make a reply to this letter, as follows:

"July 30, '96.

Mr. E. D. Easton,
New York.

Dr. Sir:

Replying to yours of 28th would say, I am not making graphophone cylinders for sale.

Very Respy.,
A. Melzer." 1586

Q. 96. Referring to Mr. Macdonald's letter to you of March 14, 1895, can you state what the analysis is that he was interested in?

A. The analysis in question was sent to Mr. Macdonald in my letter dated March 31, 1895, and is as follows:

1587

" Stearic Acid	79.580
Hydro Carbon (Ozokerite)	11.790
Rosin	0.000
Sodium Oxide ($Na\,O$)	4.752
Iron " ($Fe_2\,O_3$)	0.020
Manganese Oxide ($Mn_2\,O_3$)	0.008
Lead " ($Pb\,O$)	0.043
Sulph. Acid ($S\,O_3$)	1.641
Aluminum Oxide ($Al_2\,O_3$)	1.998
	99.837 "

Q. 97. Referring to this analysis I note that Mr. Macdonald in his letter of April 8, 1895, connects the same with " the S. L people ". What does this abbreviation mean? 1588

A. In a previous or subsequent letter to the one mentioned above Mr. Macdonald speaks of the Silver Lake people and I believe these are referred to by " S. L. people ".

Q. 98. When, and under what circumstances, did you carry on the work referred to in answer to Q. 84 for over-coming the trouble with " pin holes "

1589

A. I went to the factory of the American Graphophone Co. at Bridgeport, Conn., arriving there July 19, 1895, remaining to July 30, 1895, and there worked in the cylinder department correcting the trouble complained of by Mr. Macdonald in the manner fully explained in my answer to Q. 84.

Q. 99. When Mr. Macdonald in the patent in suit
says, (Page 1, lines 82–83) "I take stearic acid as
nearly pure as can be obtained" what do you, as a
1590 worker in the art, understand him to mean?

A. I understand him to mean by that that he obtained commercial stearic acid in the open market as nearly pure as can be obtained.

Q. 100. When Mr. Macdonald in the patent in suit
says (Page 2 lines 71–73) "After the material is
moulded to the desired form it should be quickly
cooled to ordinary temperature", what do you understand him to mean? You may also add in your answer
what your practice was in this respect in molding your
1591 composition at Evansville and at Bridgeport, as you
have testified.

A. It was Mr. Macdonald's object to prevent crystallization of the cylinder. Crystallization being promoted by keeping the crystallizable substance at a high or moderately high temperature as long as possible.

In making my experimental cylinders at Evansville
I would sometimes wrap around the cylinder molds
cloths steeped in ice water, sometimes I would place
1592 the moulds in the open window exposing them to the
colder temperature prevailing out doors, but generally
I resorted to no particular means for quickly cooling
the molds, nor were any provisions for this employed
while I worked at The American Graphophone Company's factory at Bridgeport.

Q. 101. When you went to Bridgeport to show Mr. Macdonald how to practice your process and produce your composition, as you have testified, who assisted you in your work there?

A. I can only remember a Mr. Fargo. In addition

1593 Mr. Macdonald would come in occasionally and there was also a boy or two engaged.

Q. 102. What appliances and apparatus were available there at Bridgeport at that time for working your process, and what was actually used by you there and those who assisted you there?

A. There were I think two kettles heated by gas in which the composition is made, a revolving circular frame on which the brass moulds were mounted, reamers for reaming the inside of the cylinders and 1594 suitable machines for turning and shaving the same. The entire installation gave the impression of being rather primitive.

Q. 103. The letters that have been introduced in evidence, some of which are signed A. & C. Melzer, and some A. Melzer, were all in your handwriting and written by you, were they not?

A. Yes.

Q. 104. A subpœna was issued requiring your attendance as a witness in this case was there not? 1595

A. Yes.

Cross-examination by Mr. Massie, Counsel for the Complainant:

x-Q. 105. How much caustic soda is in forty (40) degree caustic soda lye?

A. 34.96%.

x-Q. 106. How much in thirty-seven (37) degree caustic soda lye? 1596

A. 31.22%.

x-Q. 107. How much in 37½° caustic soda lye?

A. 31.85%.

x-Q. 108. How many parts of caustic soda will completely saponify one hundred parts of stearic acid?

A. Assuming that we have chemically pure stearic acid and chemically pure caustic soda the figures would be 14.08 parts of caustic soda to completely saponify one hundred parts stearic acid. But commercial stearic acid containing more or less palmitic

1597 and oleic acids would require more caustic soda; and since commercial caustic soda also is not chemically pure, there would be required more commercial caustic soda than the thereotical fiures.

x-Q. 109. How many parts of sal soda are required to saponify one hundred parts of stearic acid?

A. The atomic weight of sal soda is 143 whilst the atomic weight of caustic soda is 40, consequently it will require 3.57½ times as much sal soda as it would
1598 caustic soda to saponify a given quantity of stearic acid.

x-Q. 110. Please refer to the formulas appearing in your answer to Q. 15, the three dated in October, 1894. What is the function or effects of using stearic acid; and why did you use it?

A. The cylinder composition was to be a hard substance as we understood Mr. Macdonald, who also stated that he had used "stearine," "not stearic acid." It was evident to us that stearic acid would be
1599 preferable to the stearine, in that the stearic acid would saponify readily and in so doing no glycerine would be set free as in the case of saponifying stearine.

x-Q. 111. Did you know at that time, or did you discover as the result of your investigations after receiving the letters from Mr. Macdonald, the difference between stearine and stearic acid, and the difference in the behavior of these bodies with respect to saponification?

A. The behavior of neutral fats and fatty acids when
1600 treated with alkaline solutions are well known to soap makers, and we were fully conversant with this a, b, c of soap making long before our correspondence with Mr. Macdonald.

x-Q. 112. What is the function or effect of using caustic soda, in those same formulas, and why did you use it?

A. I understood that the composition wanted, was already in existence and in a general way was of the nature of a metallic soap, or partial soap; to produce this, it naturally followed that the stearic acid

1601

must be combined with an alkaline base, caustic or carbonate of soda or caustic or carbonate of potash. I chose caustic soda but have also experimented with the other forms of alkalies.

x-Q. 113. The purpose in using caustic soda or any other form of alkali was to produce saponification; but why did you desire to produce saponification?

A. For the reasons stated above; *i. e.* I had heard an insoluble metallic soap or partial soap, had been found to give the best results for the purpose required. 1602

x-Q. 114. What advantage was there in using caustic soda in place of any other alkali; and in using this in the form of a lye instead of dry?

A. There are only two forms of alkali that are applicable for this purpose at all; caustic and carbonate of soda. The one has no particular advantage over the other, except that the hydrate of aluminum cannot be dissolved in the carbonate and hence if carbonate were chosen for this work the hydrate of aluminum would have to be dissolved separately in a certain por- 1603
tion of caustic lye which would complicate the calculations of the material to be employed. To produce a chemical combination such as saponifying the fat or fatty acid the ingredients are never used in dry state by those conversant with the art of soap making.

x-Q. 115. I am still referring to the formulas noted in Q. 15. What was the function or effect of the ozokerite (or paraffine); and why did you use the same?

A. I used the ozokerite or paraffine wax for the purpose of producing a hard, yet wax like and impression- 1604
able material, that would take the *indentations* of the recording point which as I then understood the art of making sound records, indented the "wax" or soap cylinder.

x-Q. 116. What was the function or effect of the lead oxide you employed in those same formulas; and why did you use the same?

A. Metals possess the property of preventing crystallization in the stearates of soda. From Mr. Macdonald we learned that he had used the acetate of

1605 lead; the acetate being objectionable, we began our experiments by the employment of the oxide of lead.

x-Q. 117. What was the objection to the acetate?

A. By employing the acetate of lead in the operation of making the composition, objectionable products, (such as acetate of soda) result, which later appear on the cylinders in the form of efflorescence.

x-Q. 118. When did you first know that acetate of soda, in such compositions, would eventually produce 1606 efflorescence?

A. We do not know this from actual experience; we deduce this from general laws of cause and effect based upon the known property of the effects of certain substances one upon the other.

x-Q. 119. What, if anything, did you know about the making of compositions for graphophone cylinders before your correspondence with Mr. Macdonald began?

A. Comparatively nothing. We were to experiment, 1607 discover and invent a composition suitable for the purpose of making graphophone or phonograph cylinders and which was to be as good or better than a certain sample sent us by Mr. Macdonald, and which has been referred to as "Sample X". To start us in this work Mr. Macdonald gave us such information as he possessed on this subject.

x-Q. 120. Coming back to x-Q. 103 and x-Q. 104 what was the specific "known property" regarding the effect of acetate of soda in the composition referred to, 1608 from which you could deduce the conclusion that efflorescence would ultimately result?

A. Acetate of soda like the sulphate will not enter into combination with the fat or fatty acids and being uncombined, will eventually exude or crystallize out same as the free carbonate of soda in laundry soaps; a phenomena which is quite well known. This at least is the deduction based upon general principles of the laws of affinity and repulsion.

x-Q. 121. In those same formulas you did not pro-

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duce complete saponification. What was the reason 1609
for this, and what the result or effect?

A. Complete saponification would produce a perfect
soap; and a perfect soap minus water will not dissolve
but will char or burn if sufficient heat is applied. It
therefore becomes necessary to employ for the purpose
of dissolving the soap formed from the stearic acid and
alkali, a menstrum, for instance water, alcohol or other
liquid. However, as the cylinders should not shrink,
which would be the case if they contained water or 1610
other liquid that will evaporate, it becomes necessary
to dissolve the soap in a substance that will not
evaporate. Wax might be used for this, but the most
suitable substance is stearic acid, and the cylinder
composition in use, is in reality a stearate of soda with
an addition of wax and metallic oxide dissolved in
about equal parts of stearic acid.

x-Q. 122. Were the facts you have just recited
known to you before the correspondence with Mac-
donald began; or did you discover them as the result 1611
of your experiments undertaken for Mr. Macdonald?

A. Of course, I did not know all about cylinder compositions and how to make it before beginning on this work.

x-Q. 123. The first two formulas given in Q. 23 em-
ploy oxide of *aluminum* instead of oxide of lead; and
the remaining two formulas employ a form of tin.
Wherein does the former (oxide of aluminum) differ
in this composition from the lead oxide in the formu-
las in Q. 15? That is, what is the effect of substitu- 1612
ting the aluminum body for the lead body; and how
did you come to make this substitution?

A. We made our first experiments with the oxide of lead and sent the resulting product to Mr. Macdonald who reported that it is only fair and too gummy. We attributed the fault largely to the metal employed and in a haphazard way tried various other metals, among these, tin and alumina. Judging from general appearances of the composition resulting from the alumina formula and from report

440

1613 received on same from Mr. Macdonald we believed this the most suitable, and after that employed this metal oftener than any other in our experiments and decided finally that it was the only one that would produce entirely satisfactory results.

x-Q. 124. In the first two formulas of Q. 23 the amount of aluminum oxide employed is, comparatively speaking, about one-fourth of the amount of the lead oxide employed in the earlier formulas given in Q. 15. 1614 What would be the result, if you know, had you used about four times as much aluminum oxide; that is, by what train of thought did you come to select the quantity of aluminum oxide which you used in the formulas given in Q. 23?

A. The reason we employed less aluminum oxide, or rather the hydrate of aluminum than lead oxide, is that the atomic weight of aluminum hydrate is very much less than that of the lead oxide. Had we employed a larger quantity of the aluminum hydrate with 1615 the same quantity of caustic soda solution, the resulting composition would have been more basic; otherwise the result would not have differed materially.

x-Q. 125. What difference, if any, would it make in the graphophone cylinder, for the composition to be "more basic" in the manner indicated by your last answer?

A. A salt or soap is called acid or basic in proportion to the preponderance of either the acid or base in its composition. Alumina is a base and if the quan- 1616 tity of the alumina is increased without a corresponding reduction in the quantity of caustic soda, likewise a base, the composition would be more basic.

x-Q. 126. I mean what difference would there be in the behavior of the cylinder with regard to its use in the talking machine business? Would a cylinder rendered "more basic" by using a larger amount of the aluminum body be unsuitable for talking machine purposes; and if so, for what reasons?

A. A composition containing too large percentage of base, that is to say more than the maximum limit

1617 mentioned previously, viz: eight per cent caustic soda or its equivalent figured on basis of the stearic acid, would be difficult to mold. Otherwise, there would perhaps be no appreciable difference in the qualities of the cylinders.

x-Q. 127. Do you mean by this answer that the aluminum body is the equivalent of the caustic soda?

A. I said aluminum is a base and so is caustic soda.

x-Q. 128. What difference, if any, is there between the bodies represented by the following names, viz: 1618 oxide of aluminum; hydrate of aluminum; hydrated oxide of aluminum; and hydroxide of aluminum?

A. The latter three mean one and the same thing and frequently even dealers and manufacturers of chemicals designate this as oxide of aluminum. Oxide of aluminum is a form that has been subjected to a higher degree of heat, contains no water and is insoluble in caustic lye. The chemical formula of the oxide is $Al_2 O_3$, of the hydrate or hydroxide $Al H_3 O_3$.

x-Q. 129. What is the atomic weight of lead oxide; 1619 of aluminum oxide and of aluminum hydrate?

A. The atomic weight of lead oxide is 239; of aluminum oxide 51.4; and of aluminum hydrate 78.4.

x-Q. 130. What is the difference in results, with regard to the behavior of the composition for talking machine purposes, if in one case we use aluminum oxide and in another case we use aluminum hydrate?

A. True aluminum oxide is insoluble and hence would not be available for cylinder compositions. However, it occurs frequently that the hydrate of 1620 aluminum is termed aluminum oxide, and thus it may occur that oxide of aluminum is mentioned when the hydrate has really been used.

x-Q. 131. If in the formulas given in Q. 23, or in your subsequent formulas (in Qs. 42 and 53), instead of taking aluminum hydrate you had taken aluminum in the form of the metal, employing the same proportion of aluminum that was present in the aluminum hydrate, what reactions would take place; and what difference, if any, would there be between the composition thus

1621 made and the compositions made with the hydrate of aluminum?

A. I can conceive of no difference in the reactions and results.

Adjourned until Friday morning, February 16, 1906, at 9:30 A. M.

1622 February 16, 1906.

Met pursuant to adjournment.

Present the same parties as before.

x-Q. 132. In carrying out the process described in your direct examination is any aluminum stearate formed, and is any aluminum palmitate formed, and if so, what is the formula for each?

A. Inasmuch as aluminum is not soluble in water or 1623 in stearic acid or palmitic acid, or oleic acid, I do not believe that stearate of aluminum or palmitate of aluminum will be formed.

x-Q. 133. What is the chemical valance of aluminum?

A. I believe it is bi-valant.

Adolph Melzer.

Stipulation.

1624 It is hereby stipulated and agreed by and between counsel for the respective parties hereto that the Commissioner's certificate to this deposition be and the same hereby is waived; and that the said deposition and the exhibits introduced in connection therewith may be delivered by the Commissioner into the custody of Frank L. Dyer, Esq., counsel for defendant, to be by the latter duly returned to court before the hearing of this cause.

1625

CIRCUIT COURT OF THE UNITED STATES

DISTRICT OF NEW JERSEY.

AMERICAN GRAPHOPHONE COMPANY
vs.
NATIONAL PHONOGRAPH COMPANY.
} In Equity No. 10 March Term, 1905. 1626

EDISON LABORATORY, ORANGE, N. J.
TUESDAY, September 15th, 1906.

Met Pursuant to Agreement.

Present:
C. A. L. MASSIE, ESQ., for Complainant. 1627
FRANK L. DYER, ESQ., for the Defendant.

Stipulation.

It is hereby stipulated and agreed, for the purposes of this case, that the following is a correct copy of an agreement made and entered into between the American Graphophone Company, complainant herein, of the first part, and the National Phonograph Company, defendant herein, and Edison Phonograph Works, of 1628 the second part, on the 7th day of December, 1896:—

"MEMORANDUM OF AGREEMENT made this seventh day of December, 1896, between American Graphophone Company, a West Virginia Corporation having its principal place of business at Washington, D. C., hereinafter referred to as the Graphophone Company, party of the first part, and the National Phonograph Company and the Edison Phonograph Works, New Jersey corporations having their principal place of business at Orange, N. J., and hereinafter collectively referred to

1629 as the Phonograph Companies, parties of the second part.

WHEREAS, the Graphophone Company and the Phonograph Companies are manufacturers of talking machines and supplies therefor, and respectively own various Letters Patent relating thereto, which each interest claims are infringed by the other interest; litigation on said patents has been in progress for some time and is undecided; and it seems probable that the 1630 patents of both interests will be finally sustained by the Courts; and whereas it is believed by the parties that no commercially competitive machine can be manufactured without infringing the patents of both interests.

AND WHEREAS, in view of the foregoing and other considerations, the two interests have concluded to exchange licenses and put an end to the large expense of continuing the pending litigation.

1631 NOW, THEREFORE, IT IS AGREED AS FOLLOWS:

1. The Graphophone Company hereby grants the National Phonograph Company the right, title and license to manufacture and sell talking machines and supplies therefor under Patents No. 341,214 granted May 1886, to Bell & Tainter, and No. 341,288, granted on same date to C. S. Tainter, to the full end of the terms thereof.

2. The Phonograph Companies hereby grant to the 1632 Graphophone Company the right and license to manufacture and sell talking machines and supplies therefor under the following patents granted upon inventions of Thomas A. Edison, to the full end of the terms thereof, to wit: Nos. 382,416 granted May 8, 1888; 382,418 granted May 8th, 1888; 382,462 granted May 8, 1888; 386,974 granted July 31, 1888; 393,966 granted December 4, 1888; 393,967 granted December 4, 1888; 393,968 granted December 4, 1888; 400,646 granted April 2, 1889; 400,647 granted April 2, 1889; 400,648 granted April 2, 1889; 414,761 granted

1633 November 12, 1889 ; 430,274 granted June 17, 1890 ; 430,278 granted June 18, 1890 ; 484,583 granted October 18, 1892 ; 484,584 granted October 18, 1892, and 499,879 granted June 20, 1893.

3. The licenses granted by sections 1 and 2 are not exclusive, and are not transferable. It is also understood that no license is intended to be granted by either interest to the other under any patent not specified in sections 1 and 2, the intention being to maintain the present characteristic difference between 1634 the machines of the two interests. It is also agreed that the Graphophone Company will not apply to any talking machines which it puts out the trade-name "phonograph," and that the Phonograph Companies will not apply to any talking machines which they put out the trade-name "graphophone." It is further agreed that neither interest will bring suit against such types of apparatus or supplies as have been put out commercially by the other interest before the date of this contract, whether put out by either interest before 1635 or after this contract.

4. The parties agree to co-operate in sustaining all the patents hereinbefore specified, and in proceeding against such third persons who may infringe such patents, or any of them. If suit be brought under graphophone patents, the Graphophone Company shall bear the expense, but the Phonograph Companies shall have the right to be represented by their counsel in such suit at their own expense ; and *vice versa*, the Phonograph Companies shall 1636 bear the expense of suits brought under their patents, subject to the right of the Graphophone Company to be represented by its counsel at its expense. If either party desires a suit brought under a patent of the other, and such other for any reason declines to prosecute, the party desiring such suit shall have the right to use the name of the other party for the purposes thereof.

In Witness Whereof, the parties hereto have caused these presents to be signed and sealed the day

1637 and year first above written, each by its President thereunto duly authorized.

(Signed) AMERICAN GRAPHOPHONE COMPANY,
By E. D. EASTON,
Pres't.

Attest:
PAUL H. CROMELIN [SEAL.]
Secy.

1638 EDISON PHONOGRAPH WORKS,
By THOMAS A. EDISON,
[SEAL.] Pres't.
Attest:
J. F. RANDOLPH,
Secy.

NATIONAL PHONOGRAPH COMPANY,
By W. S. MALLORY,
Pres't.

1639 Attest:
J. F. RANDOLPH,
[SEAL.) Secy.

STATE OF NEW YORK } ss.:
County of New York }

On this 7th day of December, 1896, before me personally came Edward D. Easton, to me known, who being by me duly sworn, said that he is the President of American Graphophone Company, the corporation 1640 named as the party of the first part in the foregoing agreement, that he knows the corporate seal of said corporation, that the seal affixed to the foregoing instrument is such corporate seal, and that he executed the said agreement as President of said Corporation, and that such act is in conformity with the by-laws of said corporation.

(Signed) R. A. PIPER,
[SEAL.] Notary Public,
Kings County,
Certificate filed in New York Co.

1641

STATE OF NEW JERSEY } ss.:
County of Essex }

On this 7th day of December, 1896, before me per-
sonally came William S. Mallory, to me known, who
being by me duly sworn, said that he is the
President of the National Phonograph Company, the
corporation named as one of the parties of the second
part in the foregoing agreement; that he knows the
corporate seal of said corporation, that the seal affixed
to the foregoing instrument is such corporate seal, and 1642
that he executed the said agreement as President of
said corporation, and that such act is in conformity
with the by-laws of said corporation.

(Signed) RICHARD N. DYER,
Notary Public
State of New Jersey.

STATE OF NEW JERSEY, } ss.:
County of Essex, }

On this 7th day of December 1896 before me per- 1643
sonally came Thomas A. Edison, to me known, who
being by me duly sworn, said that he is the President
of the Edison Phonograph Works, the corporation
named as one of the parties of the second part in the
foregoing agreement; that he knows the corporate seal
of said corporation; that the seal affixed to the fore-
going instrument is such corporate seal, and that he
executed the said agreement as President of said cor-
poration, and that such act is in conformity with the
bylaws of said corporation. 1644

(Signed) RICHARD N. DYER,
Notary Public,
State of New Jersey.

And it is stipulated and agreed that the above copy may be used herein with the same force and effect as if the original agreement was duly and regularly proved, and introduced as an exhibit in this cause.

Complainant's counsel, before making the stipulation, objects to the introduction of the agreement on the ground that it is irrelevant and immaterial.

1645

Thomas A. Edison.

Thomas A. Edison, a witness produced on behalf of the defendant, being first duly sworn, deposes and says in answer to questions propounded by Mr. Dyer, as follows:

Q. 1. State your name, age, residence and occupation.

1646 A. My name is Thomas A. Edison; I am fifty nine years of age and reside at Llewelyn Park, Orange, N. J.; by occupation I am an inventor.

Q. 2. Are you acquainted with Mr. Jonas W. Aylsworth?

A. Yes.

Q. 3. Do you recall experiments made by Mr. Aylsworth at the Laboratory prior to 1890 in connection with material for phonograph blanks or records?

A. Yes.

1647 Q. 4. Do you recall the composition that was in use at the time Mr· Aylsworth took up his experiments?

A. We were experimenting with a great many compositions; I think those we were using on the phonograph were waxes like bees-wax mixed with different substances like ceresin.

Q. 5. Do you recall the use of a composition of ceresin and carnauba?

A. Yes.

Q. 6. I show you what purports to be a phonograph

1648 blank and ask you if you can identify the same?

A. That is one of the early record blanks we used as early as 1890; it is a wax blank, probably one of the mixtures I have spoken about of bees-wax and ceresin.

(The blank referred to by the witness is defendant's exhibit, yellow wax record.)

Q. 7. Did you keep track of Mr. Aylsworth's experiments as they were developed?

A. Well, generally, yes.

1649

Q. 8. Can you tell in a general way what those experiments were?

A. They were experiments to get a satisfactory record cylinder and consisted in the trial of all kinds of mixtures of waxes and other materials that would tend to produce such a record cylinder.

Q. 9. Did you make any experiments yourself along those lines?

A. Yes, I made a great many thousand experiments with the same object in view. 1650

Q. 10. Were you experimenting during the time that Mr. Aylsworth was experimenting?

A. Yes, sir.

Q. 11. During these experiments did you ever make, or did Mr. Aylsworth ever make, artificial wax-like materials, such as stearate of soda?

A. Yes, both of us made it; I believe I was the first one to bring the metallic soaps into the art.

Q. 12. Stearate of soda, then, is a metallic soap?

A. Yes, sir; acid stearate of soda. 1651

Q. 13. By acid stearate of soda do you mean a completely saponified or incompletely saponified stearate?

A. A partially saponified stearate in which there is free stearic acid.

Q. 14. What was the purpose of making the stearate of soda with free stearic acid?

A. So that it would not be affected so much by water of the atmosphere and also to diminish its melting point so that it could be mixed and handled, poured. 1652

Q. 15. How was the acid stearate of soda made?

A. There are a number of ways of making it, by precipitating in water and salting out, or the use of soda in melted stearic acid.

Q. 16. What form of soda did you first use, caustic or sal-soda?

A. In my first experiments I think I used solid stick soda.

Q. 17. Stick soda, as I understand it, is caustic soda?

1653

A. Caustic soda, yes.

Q. 18. When you had hit upon the expedient of using an acid stearate of soda, what was then done, if you remember?

A. We tried to make it less crystalline by adding different substances to it; it was a little too crystalline for a phonograph record.

Q. 19. Do you recall what substances you added to make the stearate of soda less crystalline.

1654 A. Magnesia and alumina.

Q. 20. Which of these two added metals did you consider the preferable?

A. Alumina.

Q. 21. In what form was the alumina added?

A. The first form in which it was used was in the form of chloride, which I used myself, chloride of aluminum.

Q. 22. Are you able to state, when the aluminum is added to the composition, what the chemical reaction 1655 is as to the aluminum; that is, what aluminum salt is formed?

A. Stearate of aluminum.

Q. 23. So that, so far as we have now gone, the composition to which you have testified was composed of stearate of soda, free stearic acid and stearate of aluminum; is that correct?

A Yes sir.

Q. 24. Do you recall the use of acetate of alumina as a source of aluminum?

1656 A. Yes, that came after the use of chloride of aluminum, it being an easier way of getting the alumina into the combination.

Q. 25. Was the composition to which you have testified made before your visit to Paris in the summer of 1889?

A. I cannot remember exactly, but it was somewhere around that time; before or just after.

Q. 26. Do you recall whether any experiments were made by Mr. Aylsworth or by you in connection with other fatty acids such as oleic acid or palmitic acid?

1657 A. Yes, both Aylsworth and I and some of my assistants made a great number of experiments on all kinds of fatty acids.

Q. 27. Which of the three, stearic, oleic or palmitic, was preferable?

A. Stearic.

Q. 28. Did you ever encounter any objection to the use of oleic acid?

A. Yes, it was too sensitive to the atmosphere, soft, friable. 1658

Q. 29. Is oleic acid generally found present in stearic acid?

A. In commercial stearic acid as a rule there is a percentage of oleic acid present.

Q. 30. By whom were the blank cylinders made before 1890 if you remember?

A. I think they were made down at the Phonograph Works, for commercial use.

Q. 31. Do you recall ever encountering any difficulties with the composition due to the presence of 1659 oleic acid?

A. Yes, it tended to make the cylinders sensitive to the atmosphere and a little soft; it is undesirable. It was due to oleic acid in the commercial stearic acid, but we found a maker who made stearic acid, by the old process, which was practically free from oleic acid and I remember we used this for a long time although it cost considerably more than the regular acid. From time to time we would try to use the cheaper acid, but generally had to go back to the better acid, on account 1660 of the amount of oleic acid varying in the commercial stearic acid.

Q. 32. Do you recall the name of the manufacturer of this relatively pure stearic acid?

A. Yes, a man named Mitchell.

Q. 33. In your work on phonograph compositions did you ever have occasion to observe the undesirable properties due to the presence of glycerin?

A. Yes, we used to have this trouble when we made our fatty acids from oils and other neutral fats.

1661

Q. 34. Is glycerin generally present in stearic acid?

A. Not very much except in the highly commercial acids; I do not remember that there was any in the Mitchell acid.

Q. 35. Do you recall the use of ceresin in the composition?

A. Yes; this was the material we added to prevent absorption of water from the atmosphere by the stearate of soda.

1662 Q. 36. In the year 1890, for example, are you able to state what was the ultimate composition used commercially by the Edison Phonograph works.

A. Stearate of soda, stearic acid, stearate of alumina and ceresin.

Q. 37. Do you recall the use of any other salts of alumina than the chloride or acetate, either in your experiments or in those of Mr. Aylsworth?

A. I think down at the Works they used alum, they got their alumina by precipitating alum with stearic 1663 acid, forming an aluminum stearate, which they then added to the regular composition.

Q. 38. How close a watch did you keep on this work of the developing of the composition?

A. I kept a very close watch until we developed the right composition; not a very close watch on the changing of the methods of producing the same results, such as changing the nature of the salt to produce the same ultimate result.

Q. 39. Do you recall a change from the use of caus- 1664 tic soda, to the use of carbonate of soda?

A. Yes, I remember that; that was in the nature of cheapening the process.

Q. 40. Was the composition wax made by the Phonograph Works at Orange?

A. No; for a while it was and afterwards it was made by the Edison Manufacturing Company at Silver Lake, about two miles from here.

Q. 41. What was the composition that was made by the Edison Manufacturing Company at Silver Lake?

1665 A. I think it was the same composition as made at the works as I have stated.

Q. 42. Do you recall who had charge of the manufacture of the composition at Silver Lake at first?

A. No, but I think Walter Miller had charge of it most of the time down there.

Q. 43. What is the present source of aluminum in the composition made by the phonograph works?

A. Metallic aluminum.

Q. 44. Who made that change? 1666

A. Mr. Aylsworth got that scheme up, and a very neat one too.

Q. 45. What was the object of using metallic aluminum?

A. In the first place he stated that while the price of metallic aluminum seemed to be high, really in the end it was cheaper than to go by the roundabout process of using the alum, and besides it was a very neat and rapid way of getting the exact quantity of pure
aluminum in the mixture. 1667

Q. 46, Did Mr. Aylesworth consult with you regarding this change before it was made?

A. I do not remember that he did, but he came to me I remember one day and said he was using aluminum, and it was a great success and if I remember right I doubted if it was as cheap and he showed me the figures of the production by alum and showed that the aluminum was not only better but cheaper.

Q. 47. Do you recall in what form the metallic
aluminum was first used, whether as a powder or in 1668
sheets?

A. No, I do not remember that.

Q. 48. Do you recall whether this change was made when the Edison Manufacturing Company was running at Silver Lake, or was it made after the Phonograph Works took up the manufacture at Orange?

A. I think it was made after they moved back to Orange.

Q. 49. I show you note No. 1022 in "Defendant's

1669

Exhibit, Aylsworth note book number 1000" and ask you in whose handwriting that note was made?

A. That is my handwriting.

Q. 50. What does the date, May 30, 1889, indicate?

A. It means May 30, 1889, that this record was made on that day.

Q. 51. I show you a phonograph record and ask you if you can identify the same?

A. That is one of the stearate of soda, ceresin, alu-
1670 minum records.

Q. 52. Does the peculiar formation of the end of this record indicate whether it is a recent record or an old record?

A. It looks to me like an old record made a long while ago.

> The record referred to by the witness is "Defendant's Exhibit, Wangeman, 1888 Record."

1671 Q. 53. I show you another record and ask if you can identify it?

A. That is a very old record with a blush on it due to absorption of water, due to the oleic acid in the mixture and lack of ceresin to take care of it.

> The record last shown the witness is "Defendant's Exhibit, Tucker 1889 Record."

Q. 54. I show you a small blank and ask you if you
1672 can recognize that?

A. That is one of the blanks that was experimented with a great many years ago with the object of using it in the mail. That is made of the stearic acid, ceresin, aluminum combination.

Q. 55. Do you recall whether this was made before your visit to Paris or not?

A. It was made around about that time.

> The record last referred to by witness is "Defendant's Exhibit, Mailing Cylinder."

1673

Q. 56. I show you another record and ask if you can identify the same ?

A. I recognize that as a record that was made for use on a doll.

Q. 57. How old is this ?

A. That is somewhere around 1888 or 1889 ?

Q. 58. And what composition is it ?

A. It is the same, our regular composition.

> The record last referred to is “Defendant's 1674
> Exhibit, Doll Record.”

Q. 59. As a matter of fact, so far as concerns the composition for blanks, has that compotition been changed, except in the process of making it, since 1890 ?

A. No, it has not been changed although enormous numbers of experiments have been made to see if it could not be improved, but so far it does not seem to be possible to improve it for the purpose for which to 1675
use it.

Q. 60. Did you ever witness the manufacture of the compositions commercially ?

A. Yes.

Q. 61. Do you remember what temperatures are used in cooking the material ?

A. My impression is somewhere between three and four hundred degrees Fahrenheit.

Q. 62. Can you state whether or not records or blanks employing a composition formed of stearate of 1676
soda and free stearic acid (stearic acid saponified to about 50%) stearate of alumina (both when added as such by precipitating with alum a completely saponified or neutral soda soap, and when formed concurrently with the saponification of the stearic acid by the addition of an aluminum salt, such as the acetate) and ceresin, were manufactured and sold in this country prior, say, to the year 1891, and if so whether in large or small quantities ?

> Objected to as leading.

1677 A. Yes, it was sold in quite large quantities.

Q. 63. By whom was it sold?

A. The Edison Phonograph Works.

Q. 64. Do you recall to whom it was principally sold?

A. It was sold to the North American Company. I think some was sold abroad.

Q. 65. Mr. Redfearn in his deposition has testified to the purchase by the Edison Phonograph Works and 1678 Edison Manufacturing Company between the years 1889 and 1896 of very large quantities of stearic acid, ceresin, sal-soda, caustic acid (98%), alum, acetate of alumina and powdered and sheet aluminum. Can you state for what purpose these ingredients were used?

A. For making the records, record cylinders.

Q. 66. Were you acquainted with the fact that these purchases were made?

A. Yes.

Q. 67. Mr. Redfearn has also testified as to the 1679 shipments of phonograph wax from the Edison Manufacturing Company to the Edison Phonograph Works during the period of May, 1890 and May 1896 and amounting to over 425,000 pounds. Can you state of your own knowledge what was the composition of this phonograph wax?

A. It was the regular composition of stearate of soda, ceresin, stearic acid and stearate of alumina.

Q. 68. Mr. Redfearn has also testified to the sale of phonograph records and blanks to the Columbia 1680 Phonograph Company and others in this country by the Edison Phonograph works between February 1889 and November 26, 1892, amounting to over 450,000 in number, and between the latter date and October 31, 1896, amounting to over 750,000 in number. Can you state of your own knowledge of what composition these records and blanks were made?

A. They must have been of the composition I have recited, that is to say the regular composition, because we made no other compositions, commercially.

CROSS-EXAMINATION BY MR. MASSIE : 1681

x-Q. 69. In identifying these exhibits do you remember each exhibit itself or do you judge by appearances ?

A. No, I remember the type, the look ; the shape and also the appearance.

(Signature and certificate waived.)

Adjourned until a day to be agreed upon. 1682

CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF NEW JERSEY.

AMERICAN GRAPHOPHONE COMPANY
vs.
NATIONAL PHONOGRAPH COMPANY
In Equity No. 10.
March Term, 1905. 1683

PHILADELPHIA, PA., Monday, Oct. 1st, 1906.

Met pursuant to agreement.

Present :
C. A. L. MASSIE, ESQ., for complainant. 1684
FRANK L. DYER, ESQ., for defendant.

John C. English.

JOHN C. ENGLISH, a witness produced on behalf of the defendant, having been first duly sworn testified in answer to questions propounded to him by Mr. Dyer as follows :

Q. 1. Give your name, age, residence and occupation.

1685

A. My name is John C. English, I am fifty-one years of age, I reside at Camden, N. J. and my occupation is experimental work for the Victor Talking Machine Company.

Q. 2. Were you ever employed by or connected with the Edison Phonograph Works of Orange, N. J.

A. I was.

Q. 3. When was this ?

A. I was in the Edison Laboratory and the Edison 1686 Phonograph Works, I forget the commencement of the employment but it was as early as 1888 and I left there in the spring of 1890.

Q. 4. In what capacity were you employed by the Edison Phonograph Works ?

A. As manager.

Q. 5. What, generally speaking, were your duties as manager ?

A. My duties appertained to the manufacture of the machines; the recording material being manufactured 1687 under the supervision of the laboratory; the office being under the control of the Treasurer.

Q. 6. At the time you were connected with the Edison Phonograph Works did you know Mr. Aylsworth ?

A. Yes, sir.

Q. 7. Do you know what he was working on at the time ?

A. He was working there before I was connected with the Phonograph Works, when I was with the Laboratory; he was working on the recording material.

1688 Q. 8. This recording material, you say, was made under the supervision of the Laboratory and not under your supervision ?

A. Not under my supervision.

Q. 9. You simply had charge of the mechanical part ?

A. Of the mechanical part. The molding of the material into the cylinder shape came under my supervision.

Q. 10. This material was handed to you in the form of large cakes and you molded it up ?

1689 A. It was mixed in the kettles at one time in the factory.

Q. 11. And you molded it into blanks ?

A. I molded it into blanks.

Q. 12. Prior to the time you acted as manager of the Edison Phonograph Works, what was your position ?

A. Purchasing agent for the Laboratory and Phonograph Works.

Q. 13. What were your duties as purchasing agent ?

A. To purchase such materials as were used for 1690 manufacturing or experimental purposes.

Q. 14. Do you recall ordering material for the Phonograph composition ?

A. I do.

Q. 15. Please state from your present recollections what materials were ordered by you for this purpose.

A. Stearic acid was ordered in large quantities.

Q. 16. Do you recall any other materials ?

A. Acetate of alumina, caustic soda, ceresin. I might also mention other similar materials bought from time 1691 to time previously in the early stages of the experimentation ; other materials of a similar character covering the whole broad range of the subject.

Q. 17. That is to say large numbers of materials were ordered for experimental purposes in the laboratory ?

A. Yes sir, various forms of waxes, such as paraffine and waxes.

Q. 18. But these orders I suppose were in small quantities ? 1692

A. In small quantities.

Q. 19. But the materials you have mentioned, stearic acid, caustic soda, ceresin and acetate of alumina, were ordered in large quantities ?

A. I ordered one large lot just about the time they began making the cylinders.

Q. 20. And you then became manager of the Works and gave up your position as purchasing agent ?

A. Yes sir.

1693

Q. 21. Do you remember of whom they bought this material ?

A. I have a recollection of having bought one or more lots of stearic acid from Gross, I think the address is in Murray Street, if I remember right ; acetate of alumina, I bought from Mercks ; ceresin, I think was purchased from Cegelten Brothers & Hildreth, or some similar firm name, in West Broadway just above Reed Street ; I am not altogether sure just where I 1694 bought the caustic soda, but my impression is that I bought that through the agency of the Greenback Alkali Company ; I have at times bought it there, and at that time I think I bought it through the agency of the Greenback Alkali Company whose place of business was I think in the Vanderbilt Building if I remember rightly. I remember the Greenback Alkali Company had an office there and I am not quite sure whether I bought it there or not. The Lewis Lye, as I am informed, is made by the Greenback Alkali Com- 1695 pany and in the beginning I had purchased Lewis' Lye in cans and I think I also bought it in ten-pound Greenback Alkali Company cans. That is my impression that I bought some in that way.

Q. 22. Is Lewis' Lye and caustic soda the same material ?

A. Lewis' Lye is 98% caustic soda ; that is, it is so labeled and sold as such.

Q. 23. Do you recall by whose authority these materials were ordered in large quantities ?

1696 A. I do not remember who gave the order now. I doubt if it was Mr. Edison, because I very seldom received a order from him excepting for some little experimental quantity of something. It most likely came from Mr. Aylsworth.

I also remember of having bought from the Cegelten and Hildreth firm some high melting point paraffine.

Q. 24. At the time you purchased the large lot of stearic acid, caustic acid, ceresin and acetate of alumina to which you have testified, did you know for what purpose it was to be used?

1697

A. I had a suppositional knowledge.

Q. 25. What was that?

Objected to as incompetent.

A. I knew that the stearic acid entered into the mixture, I can answer that positively, because I have seen the stearic acid melted.

Q. 26. But at that time as I understand it you were not sure of the other ingredients? 1698

A. Not absolutely positive, no sir, excepting so far as the ceresin was concerned, that I have seen put in in various proportions.

Q. 27. Into the actual composition?

A. Into the actual composition, at the time of the beginning, and it became necessary to make changes in the consistency of it and I have seen that weighed out and put in in various proportions.

Q. 28. Then as I understand it, when you were connected with the company in the early days you did see 1699 at least part of the operation of mixing the composition?

A. Yes sir, melting the stearic, and the ceresin. I have seen the stearic and the ceresin introduced as part of the composition.

Q. 29. Do you recall the general character of the blanks that were made in those days at the Phonograph Works?

A. The general character in appearance and consistency corresponded to blanks that I recently purchased. 1700

Q. 30. As far as you can tell, the composition was the same as it is now?

A. Yes sir.

Q. 31. Did you observe any tendency on the part of the blanks in the early days to mold or become spoiled on the surface?

A. In the very beginning when they were first used we had some little trouble in that way but that was only to a very limited extent.

1701

Q. 32. What did you do after you left the Phonograph Works?

A. I became manager of the New York Phonograph Company 257 5th Avenue, New York City.

Q. 33. Did the question of Phonograph composition ever come up afterwards?

A. About two or three years after leaving the Phonograph Works I was approached by Mr. Clephane on
the subject. After leaving the Phonograph Works I
1702 was with the New York Phonograph Company for
about six months and then entered into the manufacture of time recording machines under patents of my own.

Q. 34. Who was Mr. Clephane?

A. Mr. Clephane I had known as being identified with the Graphophone Company interests for several years previous to my meeting him and I supposed him at the time to be connected with the Graphophone
Company in some capacity, either as director or stock-
1703 holder.

Q. 35. Do you remember his full name?

A. I think it was J. O.—James O.; I am not sure, but I think it was.

Q. 36. What did Mr. Clephane say to you on this subject?

Objected to as incompetent.

A. He said that the Graphophone Company needed
1704 a formula for a recording material and that they were
seriously handicapped for the want of the same and that if I could make such a formula he would see that I was well paid for it.

Q. 37. Did Mr. Clephane tell you at the time what the Graphophone people had to do to get suitable recording material?

A. He said that they were using broken blanks, remolding them and also getting finished blanks through the Columbia Phonograph Company of Washington.

Q. 38. Whose blanks have you reference to?

A. Edison blanks. 1705

Q. 39. Did you make any arrangement with Mr. Clephane along the line suggested by him?

A. Mr. Clephane wrote out a contract, or had written a contract, in which I was supposedly to receive thirty thousand dollars of which he was to get twenty five per cent., if the company made the purchase of the formula.

Q. 40. Did you make this contract with Mr. Clephane or with the Company? 1706

A. It was a contract between myself and Clephane. No, I did not make one with the company, it was with Mr. Clephane.

Q. 41. Did you make any experiments with Phonograph composition based upon your knowledge or supposition of the ingredients used in the Edison formula?

A. I did at that time and made some samples which Mr. Macdonald seemed very much interested in; but having other things to attend to I abandoned the experiments until the fall of 1894. 1707

Q. 42. Do I understand that you actually made a contract under which you were to receive thirty thousand dollars in case you succeeded in making a satisfactory formula or were your experiments carried out on your own hook?

Q. 43. My experiments were carried out on my own hook.

Q. 43. Why was not the contract that Mr. Clephane expected to make completed? 1708

A. In the fall of 1894 when I took the subject up again, having more time I submitted samples to Mr. Macdonald which he approved of, but he informed me at the time that owing to the long time that I had taken to perfect it he had interested someone else, a Western chemist, in the subject and that he had samples from him which were as satisfactory as mine and that the company would not buy my formula but that he would take it himself so that he might strengthen his hold on his position with the company.

1709

Q. 44. Why was not the contract made with the company under which you were to receive thirty thousand dollars for producing a satisfactory composition?

A. Because of the delay in experiments and through my dealings with Mr. Macdonald and on account of Mr. Macdonald telling me that the company did not care to purchase my formula.

Q. 45. Do you recall what ingredients you used in
1710 the sample you submitted to Mr. Macdonald?

A. Stearic acid, acetate of alumina, caustic soda, ceresin.

Q. 46. Those were the very ingredients which you had purchased for the Edison Phonograph Works?

A. Yes sir.

Q. 47. How did your samples compare with the wax compositions made at the time by the Phonograph Works?

A. Mr. Macdonald approved of the samples as being
1711 tharoughly satisfactory.

Q. 48. As I understand it you submitted samples to Mr. Macdonald at two different times, first in 1892 or 1893 and then later in the fall of 1894, is that correct?

A. That is correct.

Q. 49. And all of these samples were of substantially the same kind and made of the same ingredients?

A. The same ingredients.

Q. 50. When you submitted these samples to Mr.
Macdonald in the Fall of 1894 did he purchase the
1712 formula from you?

A. He did.

Q. 51. Do you recall in what month in 1894 this was?

A. I think it was in November.

Q. 52. How do you fix the date?

A. I have here a Western Union telegraph message received from Mr. Macdonald as follows: " Have missed train, will reach there about four ".

Q. 53. What is the date of this telegram?

A. November 2nd, 1894.

1713

Q. 54. What does this telegraph indicate?

A. That he had made an engagement with me upon the blank question and, while I am not positive, I think it was in connection with the purchase of the formula.

> The telegram produced by the witness is marked "Defendant's Exhibit, Macdonald Telegram."
>
> Objected to as irrelevant, immaterial and incompetent. 1714

Q. 55. Did Mr. Macdonald come to New York as he states in his telegram?

A. He did.

Q. 56. Do you recall what transpired at the interview between you and Mr. Macdonald on this subject?

A. Do you mean at the time when the purchase took place?

Q. 57. Yes. 1715

A. I mixed up some pounds of the material and he approved of the mixture and gave me a check for five hundred dollars in payment for the same.

Q. 58. And you gave him the formula then?

A. I gave him the formula—mixed it in his presence, weighed the material in his presence.

Q. 59. Do you recall off-hand what the formula was?

A. Not the proportions, but the ingredients were stearic acid, caustic soda, acetate of alumina and ceresin. 1716

Q. 60. Did you keep a copy of the formula that you gave Mr. Macdonald?

A. I have not it at the moment, but I think I—I really cannot say that I have a copy of it.

Q. 61. Will you make a search and see if you cannot obtain a copy of this formula?

A. I do not think I can because the great mass of papers bearing on this subject was destroyed in a storage warehouse in Camden a short time ago and I think the books that contained my data on this subject were

466

1717 destroyed by the fire; I will, however, make a search and if I find it I will let you know.

Q. 62. Did Mr. Macdonald seem pleased at obtaining this formula from you?

A. Very much pleased.

Q. 63. Where were you located when you made this batch of material and gave the formula to Mr. Macdonald?

A. I was proprietor of a drug store on Eighth Avenue about 50th street, New York. 1718

Q. 64. When did you acquire this drug store?

A. A very short time previous to the sale of the formula.

Q. 65. After you gave the formula to Mr. Macdonald what was then done?

A. Mr. Macdonald had me take him downtown and place him in contact with the sources of supply of the material.

Q. 66. These people that you had ordered these materials from when you were with the Edison Phonograph Works? 1719

A. I do not remember the places I took him to, but I remember the circumstance of assisting him in getting at the right people.

Q. 67. Did Mr. Macdonald ever attempt to have you come to Brideport to help him make this composition?

A. Some months after the sale of the formula he requested me to come up.

Q. 68. Did you go?

1720 A. I did not.

Q. 69. Did you ever go to Bridgeport after you gave Mr. Macdonald your formula?

A. Not in connection with the cylinder material.

Q. 70. Did Mr. Macdonald ever tell you that he had tried in numerous ways to acquire the Edison formula?

Objected to as incompetent.

A. He did.

Q. 71. Do you recall what he said on this point ? 1721

The objections are repeated without being stated each time.

A. There were remarks made on the subject but I do not remember whether it was Mr. Macdonald or his assistant who made them ?

Q. 72. Who was his assistant ?

A. If I remember rightly it was Mr. Dodge. 1722

Q. 73. Do you recall what Mr. Macdonald or Mr. Dodge said ?

A. That efforts had been made to secure the formula through secret agents at the Phonograph Works.

Motion to strike out the answer as incompetent.

CROSS-EXAMINATION BY MR. MASSIE : 1723

x-Q. 74. You ordered a great many materials for the Edison Phonograph Works and the Edison Laboratory besides those you have named did you not ?

A. I did.

x-Q. 75. Did you purchase any other materials besides those you have named, except such as would be employed in making machines ?

A. I did.

x-Q. 76. When Mr. Macdonald or Mr. Dodge, whoever it was, spoke to you about getting the Edison formula did you tell them, or did you yourself have reason to believe that the formula you had already sold to Mr. Macdonald was practically the Edison formula. 1724

A. I was not originally approached by either one of these gentlemen ; I was approached by Mr. Clephane in the first instance. These two gentlemen did not approach me on getting the formula.

x-Q. 77. I understood that after you had sold the formula to Mr. Macdonald someone had spoken of the

1725 secret agents of the Graphophone Company trying to find out the Edison formula?

A. No, that was during the periods when I first had my talks with them; that was what they had been trying to do before they saw me back in the early experiments.

x-Q. 78. Considering the two different occasions
upon which you submitted samples for Mr. Macdonald,
I understand that the samples submitted in 1892 or
1726 1893 had the same ingredients as those submitted
later.

A. Correct.

x-Q. 79. But were they in the same proportions?

A. The proportions most likely varied; the proportions may have varied somewhat but they were approximately the same.

x-Q. 80. These samples that you submitted, were
they made up by you as the result of experiments or
were they put together from your knowledge of what
1727 Edison's formula was?

A. My experience with the Edison Phonograph Works naturally suggested the method of procedure in my experiments; the proportions I acquired through my general knowledge of the subject. My early experience in life was in pharmaceutical laboratory work and I have made large quatities of metallic soap compounds, lead soaps and mercury soaps.

x-Q. 81. Did you meet Mr. Macdonald during the
first period, that is the year or more previous to the
1728 time that you showed him the second batch?

A. Yes sir.

x-Q. 82. Where, in Bridgeport or New York?

A. In Bridgeport.

x-Q. 83. Can you explain a little more fully why it was that you did not take up the matter with Mr. Clephane and attempt to put through the contract with the Graphophone Company, under which you were at that time in a position probably to receive thirty thousand dollars?

A. My experiments were not altogether successful

1729 nor had the samples been approved of by Mr. Macdonald, and, secondly, business troubles due to the panic interfered with my continuing my experiments.

x-Q. 84. I understand that when you submitted the second batch of samples the results of the experiments were successful; what was the difficulty with the first lot of experiments and in what way did you overcome the difficulty?

A. I knew more about the subject at the later
period than at the former period; I had acquired 1730
more knowledge of the composition.

x-Q. 85. What was the particular specific difficulty and in what respect were your earlier experiments unsuccessful?

A. Variations in material.

x-Q. 86. Can you give us the details; what did you do in making the second samples that was not done in making the first lot, or what did you leave out in the second samples that was present in the first lot.

A. I left nothing out but used materials purer and 1731
more carefully made.

x-Q. 87. Were the *methods* of procedure, the steps taken, the amount of temperature use, etc., identically the same in making both batches of samples?

A. In my experiments there were slight variations in
the proportions of the materials, the temperatures
were generally approximately the same, but I found a
considerable difference in the quality of the material
from different sources, but the formula remained, to
all intents and purposes, the same from first to last. 1732

RE-DIRECT EXAMINATION BY MR. DYER:

Q. 88. Do you recall generally what the process was of making the samples that you submitted to Mr. Macdonald and which you described to him?

A. The partial saponification of the stearic acid and caustic soda and afterwards the addition of the acetate of alumina followed by the addition of the ceresin.

Q. 89. Do you recall how the stearic acid was par-

1733 tially saponified by the caustic soda, that is to say in what form was the caustic soda used?

A. I do not remember.

Re-cross-examination by Mr. Massie:

x-Q. 90. I understood you to say that when you imparted the formula to Mr. Macdonald he had already, before that time, told you that the Graphophone Company had already obtained samples from a Western Chemist, is that correct? 1734

A. Correct, yes sir.

x-Q. 91. Did he tell you the name of the Western Chemist?

A. He did not.

x-Q. 92. Did he tell you or did you understand whether these samples from the Western chemist were practically similar to the samples you had produced?

A. He only spoke of them as being very satisfactory.

1735

Further Re-direct Examination by Mr. Dyer:

Q. 93. At the time you disclosed your formula to Mr. Macdonald did he tell you that he had obtained the formula from a Western chemist?

A. My impression is, or my recollections are, that he said the company had acquired it.

Q. 94. After you disclosed your formula to Mr. Macdonald did he say that he considered it important that the company should have it?

1736 A. He did. He very cheerfully informed me that the company was in a critical condition and could not have gotten along without his having received it; all of which made me very angry.

Further Re-cross Examination by Mr. Massie:

x-Q. 95. Why did it make you angry?

A. Because I had not got more than the five hundred dollars, as I had expected if the deal had been made with the company.

1737

FURTHER RE-DIRECT EXAMINATION BY MR. DYER:

Q. 96. Before you disclosed the process to Mr. Macdonald did he lead you to suppose that he or the company had the formula of the Western chemist?

A. He led me to believe that the company had purchased the formula and that he was only buying this formula himself, and not the company.

Q. 97. And after he had obtained your formula he then told you that they did not have the formula of the Western chemist, is that correct? 1738

A. That is correct.

Signature and certificate waived.

Adjourned subject to notice.

UNITED STATES CIRCUIT COURT,

DISTRICT OF NEW JERSEY.

1739

AMERICAN GRAPHOPHONE COMPANY
vs.
NATIONAL PHONOGRAPH COMPANY.
} In Equity.

OFFICE OF THE COLUMBIA PHONOGRAPH COMPANY,
90 WEST BROADWAY, NEW YORK CITY.
TUESDAY, Oct. 2, 1906. 1740

Met pursuant to agreement.

Appearances:
C. A. L. MASSIE, ESQ., for Complainant.
FRANK L. DYER, ESQ., for defendant.

Victor H. Emerson.

VICTOR H. EMERSON, a witness produced on behalf of defendant being duly sworn, testified as follows, the

1741 signature of the witness and the certificate being waived.

Direct Examination by Mr. Dyer:

Q. 1. Give your name, age, residence and occupation?

A. Victor H. Emerson; age forty; residence No. 46 Morningside Drive, New York City; occupation,
1742 Superintendent of Musical Department Columbia Phonograph Company.

Q. 2. How long have you been connected with the Columbia Phonograph Company?

A. About seven years.

Q. 3. Were you ever employed by or connected with the United States Phonograph Company of Newark, New Jersey?

A. I was.

Q. 4. When was this?

1743 A. Just prior to my connection with the Columbia Company.

Q. 5. And how long had you been connected with the United States Company?

A. I think about two or three years.

Q. 6. Were you ever connected with the New Jersey Phonograph Company?

A. I was.

Q. 7. Was this during the time of your connection with the United States Company?

1744 A. The United States Company superseded the New Jersey Phonograph Company—took over all of their business.

Q. 8. What position did you hold with the United States Phonograph Company?

A. I was President of that Company.

Q. 9. What business was the United States Phonograph Company engaged in?

A. Practically engaged in the manufacture of musical records.

1745 Q. 10. Do you recall whether the United States Company was in business before the National Company?

A. My impression is that it was.

Q. 11. When you were connected with the United States Company, from whom did you buy blanks on which to make records?

A. We bought blanks from the Works at Orange, I do not know whether it was known at the time as the Edison Works or the National Phonograph Company. 1746 We also bought blanks, or, rather, we also bought material for blanks from a man named Petit, in Newark. The blanks, however, we molded into form of blanks. We also bought some blanks from the American Graphophone Company who had their office in Washington D. C.

Q. 12. During the time you were connected with the United States Company or the New Jersey Company, did anyone connected with the American Graphophone Company come to you and ask you to divulge to that 1747 company the formula of the Edison Blanks?

A. Not to my knowledge. I knew nothing of the making of blanks, never had made any up to that time.

Q. 13. Mr. Cromelin did not come to you and ask you to divulge the Edison formula then?

A. I do not recollect any such occurrence.

Q. 14. Do you recollect having had any correspondence with Mr. Easton, the President of the American Graphophone Company, in which he urged you to 1748 divulge to that company the secret of the Edison formula?

A. I do not recollect it. I don't say that it did not happen, but I do not recollect it.

Q. 15. I show you an affidavit made by you on November 28, 1894 and filed with the Clerk of this Court at Trenton, on December 4, 1904, in a suit entitled The American Graphophone Company v The United States Phonograph Company, *et al.* and will

1749 ask you to read the same and state whether this in any way refreshes your recollection.

Objected to as irrelevant and immaterial.

A. Why, I presume from the affidavit that all of this correspondence mentioned took place. I do not recollect the correspondence. Is that satisfactory, Mr. Dyer?

1750 MR. DYER: Yes.

Q. 16. Do you recall Mr. Cromelin's visit to you?

A. I do not.

Q. 17. As I understand it then, the whole transaction recounted in the affidavit has faded from your mind?

A. Yes sir.

1751 The affidavit shown witness is offered in evidence and marked "Defendant's Exhibit Emerson Affidavit".

Objected to as irrelevant, immaterial and incompetent on the ground that the affidavit referred to was made in a suit between parties different from the parties in this suit.

No cross-examination.

Signature and certificate waived.

1752

1753

AMERICAN GRAPHOPHONE COMPANY,

vs.

NATIONAL PHONOGRAPH COMPANY.

In Equity No. 10
March Term 1905.

1754

ORANGE, N. J., Saturday, Oct. 27th, 1906.

Met pursuant to adjournment.

Present:
C. A. L. MASSIE, ESQ. for Complainant,
FRANK L. DYER, ESQ., for Defendant.

Elmer E. Higgins.

ELMER E. HIGGINS, a witness produced on behalf of defendant, having been first duly sworn, testifies as follows: 1755

BY MR. DYER:

Q. 1. Give your name, residence and occupation?

A. Elmer E. Higgins, age 43 years, residence 113 Green street, Newark, N. J., occupation, engineer and machinist.

Q. 2. Were you ever employed by the Edison Manufacturing Company at Silver Lake? 1756

A. Yes, sir.

Q. 3. Do you recall how long you worked for the Edison Manufacturing Company at Silver Lake?

A. Between 13 and 14 years, I think.

Q. 4. When did you leave the Company's employ—how long ago?

A. About four years ago.

Q. 5. Then as I understand it, you were employed between about 1889 to 1892.

A. Yes.

1757

Q. 6. Did you ever have anything to do with the manufacture of the phonograph composition by the Edison Manufacturing Company at Silver Lake?

A. Yes, sir.

Q. 7. What did you have to do with this material?

A. Manufactured it throughout, according to the instructions by Mr. Aylsworth.

Q. 8. You worked under Mr. Aylsworth and carried out his suggestions.

1758 A. Yes.

Q. 9. How long did you continue to make the wax composition for the Edison Manufacturing Company?

A. I do not remember exactly.

Q. 10. Did you continue to make the composition up to the time you left--about 1902?

A. No, sir.

Q· 11. Did the Edison Manufacturing Company stop making the composition before that time?

A, Yes sir.

1759 Q. 12. Do you know where it was made after the Edison Manufacturing Company stopped making it?

A. Here at Orange.

Q. 13. By whom—the Phonograph Works?

A. Yes, sir—I came over and gave the gentleman the formula. I laid the formula down on the bench and showed him how to make it.

Q. 14. You came here to Orange and showed the formula to the man who was to make it for the Phonograph Works?

1760 A. Yes sir.

Q. 15. Do you remember this man's name?

A. Aschenger.

Q. 16. Do you remember what the ingredients were that you used, or some of the ingredients used in this composition?

A. Yes sir.

Q. 17. Tell me what the ingredients were, as you remember now.

A. Stearic acid or stearine,—stearic acid we always

Raymond R. Wile Research Library

1761 called it—sal-soda, caustic soda, aluminum bronze, ceresin and water.

Q. 18. Do you remember anything about the process that you carried out in making this composition?

A. I could not tell it to you now just as we used to make it—I have forgotten.

Q. 19. You do not remember anything at all about it?

A. I know how we used to do with the old formula; we use to put the powder in the same as we put the aluminum bronze in. The aluminum bronze was mixed 1762 with boiling water and dissolved and strained, and put into the wax afterwards. We used to make about 600 lbs. of the wax, and we gradually put the aluminum bronze in with it.

Q. 20. You remember then, that you made a solution of the aluminum, and added the solution to the stearic acid?

A. Yes sir,—later the ceresin was put in.

Q. 21. You refer in your last answer to the "old formula." What was the difference between the old 1763 formula and the new formula?

A. Well, that was made in a different way; we made a powder of the caustic soda and stearic acid and did not use aluminum bronze at that time. We used alum with the old formula.

Q. 22. When you speak of the aluminum bronze, you have reference to a different formula from the old formula, in which a powder was employed and in which alum was used?

A. Yes. 1764

Q. 23. When did you first know about the new formula, using aluminum bronze?

A. I could not tell that—I cannot remember the date.

Q. 24. Was it before the Edison Manufacturing Company gave up the manufacture of the wax—was it while you were still over at Silver Lake making the wax?

A. Yes.

1765 Q. 25. Do you remember how long it was before the Edison Manufacturing Company gave up the manufacture of wax at Silver Lake that aluminum bronze was used?

A. It must have been pretty nearly two years.

Q. 26. It was for a considerable time that you were making the formula with the aluminum bronze at Silver Lake?

A. Yes.

1766 Q. 27. How was it that your attention was first called to the new formula, using aluminum bronze?

A. Through Mr. Aylsworth and Mr. Miller.

Q. 28. Do you remember what day of the week this was?

A. Sunday.

Q. 29. What was done at that time?

A. They gave me the proportions to use in the formula. We mixed a batch of wax ourselves—that is, between us.

1767 Q. 30. That is, you and Mr. Aylsworth and Mr. Miller made a batch of wax.

A. No, they made the solution, and I made the wax myself.

Q. 31. Did you do all this on Sunday?

A. No, not all, I made it on Monday.

Q. 32. After Mr. Alysworth, Mr. Miller and you made this wax with the aluminum bronze, did the Manufacturing Company then give up the old formula and take up the new formula with the aluminum bronze? 1768

A. I do not know whether they did, or whether the Phonograph Works did it.

Q. 33. Was the wax using aluminum bronze powder made at Silver Lake?

A. Yes.

Q. 34. Did you make the wax in which this aluminum bronze powder was used at Silver Lake?

A. Yes.

Q. 35. Do you know whether the Edison Phono-

1769 graph Works was at Silver Lake manufacturing the wax or not?

A. I do not know whether they did it or whether the Manufacturing Company did it—I think it was the Phonograph Works, but I could not say that.

Q. 36. But you are sure that the aluminum bronze was used at Silver Lake before the manufacture was taken up at Orange.

A. Yes sir, how would I have the formula if it was not. 1770

Q. 37. I show you two pencil memoranda which appear to relate to wax formulas, and ask if you know in whose hand-writing they are?

A. I certainly do, it is in my hand-writing.

Q. 38. Do you recall what these notes were made for?

A. Yes sir.

Q. 39. What were these notes made for.

A. The formula of the wax that was made at Silver Lake. 1771

Q. 40. Who gave you these formulas?

A. I was instructed by Mr. Aylsworth to do this work and made a memorandum of what I did.

Q. 41. I observe that these two notes are dated March 19th and March 28th respectively. Do you know what year they were written in?

A. No sir, I cannot tell.

Q. 42. Were these notes prepared by you before you gave up the manufacture of wax at Silver Lake? 1772

A. Yes sir.

Q. 43. Do you remember writing these two notes?

A. Yes sir.

The two notes referred to by the witness are offered in evidence and marked "Defendant's Exhibit, Higgins' Note No. 1", and Defendant's Exhibit Higgins' Note No. 2".

By Mr. Massie: The exhibits are objected to as irrelevant and immaterial.

1773

Q. 44. In the two notes which have been introduced as exhibits, reference is made to “#1”, do you know what that means?

A. Yes.

Q. 45. What is it?

A. It means grams of No. 1 powder.

Q. 46. What was No. 1 powder?

A. Aluminum bronze.

Q. 47. When you carried on the manufacture of the
1774 wax composition at Silver Lake and used the aluminum bronze powder, after the solution was added to the stearic acid, did you keep up the heat in the manufacture?

A. Yes sir, until it was all foamed off—it was heated up to about 550°F.

Q. 48. You remember that it was heated to a very high temperature?

A. Yes, sir.

Q. 49. In one of your previous answers, you stated
1775 that the aluminum bronze powder was dissolved in boiling water; are you sure about this being boiling water?

A. Yes, sir, and the caustic soda with it; it was strained after that and put in the wax until we had it all in.

Q. 50. That is to say, as I now understand it, you made a solution of boiling water and caustic soda and aluminum bronze powder, then you strained the solution, then you added the solution slowly to the melted
1776 stearic acid, then you added the ceresin after it was all in, and you kept up the high temperature?

A. Yes, sir, we kept up the high temperature, I think about 550° and if we got it over 600° it caught on fire.

Q. 51. And this temperature was kept up until the material foamed off?

A. Yes, sir.

Q. 52. What do you mean by “foaming off”?

A. It was water and different things in the material

1777 and ceresin and stearic acid and when all the foaming ceased, it foamed off.

Q. 53. After the manufacture of the wax was given up at Silver Lake and was taken up at Orange, did you ever have occasion to come up to Orange?

A. No, sir.

Q. 54. Never came over here at all?

A. Well, I came over on account of dirt, or something like that—nothing else.

Q. 55. What do you mean by "coming over here on account of dirt"? 1778

A. Any grit or dirt that was in the composition that had not been filtered right—I might have been called over here on that account to help them out, not exactly to help them out, but to point out what the trouble was.

Q. 56. That is, if they had any trouble over here in the composition you were called to help them out?

A. Yes, sir.

Q. 57. Did you ever meet a man named Storms over here at Orange? 1779

A. Yes, sir.

Q. 58. What was Storms doing?

A. I think he was molding or had charge of the boys who molded the cylinders.

Q. 59. Did Storms seem to be curious about the composition?

A. He use to often ask me what things we used, just what stuff was in the wax.

Q. 60. Did you ever talk with Storms about the composition? 1780

A. Yes, I suppose I have.

Q. 61. Storms was anxious to know what the composition was made of and you talked with him about it?

By Mr. Massie: Objected to as incompetent.

A. Yes.

Q. 62. With reference to two notes "Defendant's Exhibit Higgins' Note No. 1" and "Defendant's Ex-

1781 hibit Higgins' Note No. 2," these two notes were written by you after the Sunday that you and Mr. Aylsworth and Mr. Miller first worked on the aluminum bronze, and before the manufacture of the wax was moved from Silver Lake to Orange?

A. Yes sir, that is right. After they began to make the wax here at Orange I came over sometimes two or three times a week when they had trouble with it and helped them out.

1782

CROSS-EXAMINATION BY MR. MASSIE:

x-Q. 63. Why was the aluminum bronze called "No. 1"?

A. That was their idea of doing the thing I suppose —I do not know why it was called No. 1.

x-Q. 64. Did I understand you to testify just now that when the preparation of the wax composition had been brought over here to Orange that for a while they 1783 had trouble two or three times a week and you had to come here and give them your advice and assistance?

A. That was on account of grit and dirt, or something or other like that. That was the only thing I came over here for.

x-Q. 65. I mean, I correctly understood you to say that this had been two or three times a week.

A. I use to bring the wax here on a wagon myself, and if there was anything to criticise I tried to do it between ourselves—Storms and I, or whoever was 1784 working on the wax.

x-Q. 66. The periods during which you were talking with Mr. Storms were before the manufacture of the wax composition was given up at Silver Lake, while it was made at Silver Lake, not afterwards?

A. Yes.

x-Q. 67. After you quit compounding the wax at Silver Lake, and they began to manufacture it up here at Orange, did you have occasion to discuss the matter then?

A. No, sir.

1785

x-Q. 68. What is the difference between the formula of "Higgins' Note No. 1" and "Higgins' Note No. 2"?

A. There is a little difference in the congealing point, that is about all.

x-Q. 69. When would you use one of these formula and when would you use the other?

A. That was by instructions from Mr. Aylsworth, after the first wax was tested, you know, we made the other. 1786

x-Q. 70. I understand that the one bearing the date March 19th, was the first you took down, and that after testing that you got the second one dated March 28th, and then the March 28th one was the one that was used thereafter. Is that correct?

A. Yes, sir.

x-Q. 71. Did you tell Mr. Storms what "No. 1" meant?

A. I might have told him, I cannot say whether I did or not, I do not think I ever did. 1787

x-Q. 72. After the manufacture of this phonograph composition was discontinued at Silver Lake, you had nothing more to do with it?

A. No, sir, all I did was to come here to give them instructions here, as I told you before, gave the formula to Mr. Aschenger and left the formula with him.

x-Q. 73. When you brought the formula up here, that was the beginning of the manufacture at Orange as far as you know—I mean that you had nothing 1788 more to do with it?

A. No, sir.

x-Q. 74. Have you thought of the matter at all until recently?

A. No, sir, not until recently when Mr. Dyer spoke to me about it.

RE-DIRECT EXAMINATION BY MR. DYER:

Re-d. Q. 75. After you commenced to manufacture the wax at Silver Lake with the new formula, using

1789 aluminum bronze, did you make the wax in large quantities ?

A. Yes, sir.

x-Q. 76. How large batches did you make ?

A. We made from 300 to 900 lbs.

Re-d. Q. 77. And did you make the wax right along ?

A. Yes, sir.

Re-d. Q. 78. After you started to use the metallic aluminum process, did you use substantially or about 1790 the same formula right along ?

A. Yes.

Re-d. Q. 79. And any changes were simply changes in small proportions ?

A. Yes.

Re-d. Q. 80. But the wax was made in large amounts and sent over to Orange for use ?

A. Yes, batches of 900 lbs.

Re-d. Q. 81. And did the change in the small proportions make any difference in the wax itself ?

1791 A. No, all the same wax.

Signature and certificate waived.

1792

1793

UNITED STATES CIRCUIT COURT

DISTRICT OF NEW JERSEY.

AMERICAN GRAPHOPHONE COMPANY
Complainant,
vs.
NATIONAL PHONOGRAPH COMPANY,
Defendant.

In Equity
On Letters Patent
No. 606,725.

1794

Stipulation.

It is stipulated and agreed between counsel for the
respective parties that if Frank L. Dyer were regu-
larly called and sworn as a witness on behalf of de-
fendant herein, he would testify as follows: That he is
solicitor and counsel for defendant; that as soon as
he ascertained from the testimony taken on behalf of 1795
defendant, that Charles Aschenger had charge of the
manufacture of the wax composition by the Edison
Phonograph Works, when such manufacture was re-
sumed at Orange, about June, 1896 he adopted such
measures as occurred to him to locate Mr. Aschenger, in
order that the latter might be called upon as a wit-
ness for defendant, but that he was unsuccessful
in finding him; that he was informed by Jonas W.
Aylsworth, a witness herein, that he, Aylsworth, un-
derstood that Mr. Aschenger was dead; that upon in- 1796
quiring from David A. Dodd, another witness herein
who succeeded Mr. Aschenger, the said Dodd replied
that he knew nothing whatever concerning his present
whereabouts; that upon inquiring of Mr. Charles
Wurth, an employee of the Edison Laboratory, he was
informed that the last heard from Aschenger was that
the latter was somewhere in Europe, but that a certain
Dr. Henogger of New York would be probably able to
tell something about him; that thereupon, Joseph F.
McCoy, an employee of the Legal Department of the

1797 National Phonograph Company, was instructed to interview Dr. Henogger, the result of which was reported to Mr. Dyer in a letter dated February 26th, 1906, as follows:

"Feb. 26th, 06.

Mr. Frank L. Dyer,
Orange, N. J.

1798 Dear Sir:—

I saw Dr. Henogger. He said that about two years ago Chas. Aschenger was in England, but in what part of the country he did not know. Mrs. Aschenger died here in New York about three years ago. A letter was received from Chas. Aschenger postmarked England and was returned to him about two years ago. Dr. Henogger thinks that he is in London now or in some part of the country, and that he could be located.

1799 Yours very truly,
Joseph F. McCoy."

That upon receipt of this report, Mr. Dyer immediately wrote to his correspondent in London, as follows:

"Feb. 27, 1906.

G. Croydon Marks, Esq.,
18 Southampton Bldgs.,
London, England.

1800 Dear Sir:—In a suit that I am defending for the National Phonograph Company, it is necessary to prove continuous manufacture of phonograph blanks in the years 1894 to 1897 inclusive. The formula for the composition was kept a secret and was known practically only to the foreman in charge of the composition building, and this formula was passed through the hands of, and became known to, successive foremen. One of the foremen in charge of this work was named Charles Aschenger, who took charge sometime in

1801 1896 and who left in May, 1897, being succeeded by David A. Dodd.

I am informed that Aschenger is at present in England, and probably in London. It occurs to me that by consulting a detective and by advertising judiciously, he might be located, and I wish you would see if this cannot be done. If Aschenger is found I would like to have his recollection on the following points:

1802 (1) What was the formula for composition for phonograph blanks used by the Edison Manufacturing Company or Edison Phonograph Works at the time he had charge of the Wax Room?

(2) If he does not remember the exact formula, would he be able to say that the composition contained stearic acid, ceresin, sal-soda, caustic soda, and metallic aluminum?

(3) What was the process used in making the composition?

1803 (4) Does he remember that it was the practice to make a solution of metallic aluminum and caustic soda lye before adding the same to melted stearic acid?

(5) In what form was the metallic aluminum used, *i.e.*, as a powder or in sheets, or in both?

(6) What was the temperature at which the composition was "foamed off?"

(7) Did Aschenger ever disclose the process or formula to Frank A. Storms?

1804 (8) Did Aschenger ever disclose the process or formula to the American Graphophone Company?

(9) Did he ever work for the American Graphophone Company after leaving the employ of the Edison Phonograph Company?

I will be very much obliged if you will give this matter your early attention, advising me by cable whether you are able to locate Aschenger and as to the result of your interview with him.

FLD/ARK

Yours very truly,
FRANK L. DYER."

1805 That on March 9th, 1906, the above letter was acknowledged as follows:

"London, March 9th, 1906.

re Aschenger.

Dear Mr. Dyer: I have your's in respect to the above named and I have put enquiries in hand at once to see if I can track this gentleman.

1806 Immediately upon doing so I will communicate with you as well as reporting in the interim.

Yours faithfully,

G. Croydon Marks."

That on May 1st, 1906, Mr. Marks wrote Mr. Dyer as follows:

"London, May 1st, 1906.

1807 "Dear Mr. Dyer: In reference to your communication of February 27th, *re.* Mr. Aschenger, I have advertised in papers likely to be seen by this person if in London but have had no response to any of them. I suggested that if he communicated at a certain address he might hear of something to his advantage. I am afraid that he is not accessible.

Yours faithfully,

G. Croydon Marks."

1808 That the efforts thus made to locate Mr. Aschenger were as complete and comprehensive as were possible under the circumstances.

C. A. L. Massie
For complainant.
Frank L. Dyer
For defendant.

In the Circuit Court of the United States for the District of New Jersey.

AMERICAN GRAPHOPHONE COMPANY *vs.* NATIONAL PHONOGRAPH COMPANY.	In Equity. No. 10, March Term, 1905. On Macdonald Patent, No. 606,725.

Rebuttal Testimony.

(*Filed September 20, 1907.*)

Complainant's proofs in rebuttal taken for final hearing before W. R. MILLER, ESQ., Notary Public, at the Factory of the American Graphophone Company, Bridgeport, Conn., beginning at 11 A. M., May 13, 1907.

Met pursuant to notice and agreement.

Present—Mr. MASSIE, for complainant, Mr. DYER and Mr. CHURCH, for defendant.

And thereupon, T. H. MACDONALD, a witness produced by complainant, being duly sworn, testifies as follows:

By Mr. MASSIE:

Q. 1. State your name, age, residence and occupation?

A. Thomas H. Macdonald, 47; Bridgeport, Conn.; Manager of Factory of American Graphophone Company.

Q. 2. What postions and experience have you had in the talking-machine business?

A. In 1889 I began work with the Eastern Pennsylvania Phonograph Co. in Philadelphia. In August of 1889 I was made general inspector of the North American Phonograph Co. In April of 1891, I began work with the American Graphophone Co. as chief experimentalist, and was made acting manager of the factory during the year 1892, and was made manager of the factory during the year 1893.

Q. 3. Are you acquainted with the composition for graphophone cylinders which is described in the patent in suit; and if so when did you become acquainted with such composition, and under what circumstances?

A. I am acquainted with such composition. I first became acquainted with it while I was experimentalist for the American Graphophone Co. This was before I became manager of the

Company. It was some time in 1891 or in 1892. My first acquaintance with it was when I made it myself for use on the graphophone. This composition consisted of, first, a quantity of free stearic acid; second, about the same amount of stearic acid saponified as with caustic soda or sal soda; third, a small percentage of some other metal; fourth, some hydro-carbon wax.

Some time in 1891, it was probably in March, Mr. Thomas R. Lombard who was at that time vice-president of the North American Phonograph Company, in conversation with Mr. N. E. Russell and myself (Mr. Russell was manager then of the Graphophone factory), stated that the North American Phonograph Company owned the patents for the Phonograph which they had purchased from Mr. Edison, but they did not have the formula for the cylinder composition. He stated that as far as he knew the patent which was given by Edison did not cover the cylinder which was used and which has been used by the Company, and that he thought it was necessary for them to obtain some cylinder composition or else they would be absolutely helpless and dependent entirely upon the Edison works for furnishing of the cylinders; that they, in other words, have gotten only half of the machine, having the patent for the construction of the machine, but having nothing from which to make the cylinders; and he requested that I should take up this line of experiment. He also told me that he had had a chemist make some experiments according to a patent which they had obtained from Edison, but that nothing could be made from it and that it would be necessary for me to go into the thing from the bottom. It was upon this request of Mr. Lombard's that I began my first experiments upon the cylinder material for the graphophone. These experiments were carried on in Bridgeport and at first were under the authority of Mr. N. E. Russell who, as I said before, was then manager of the factory of the Graphophone Company. The first attempt that I made at obtaining a material was the mixing of what is known in chemistry as "lead soap"; also known as "lead plaster" in medical terms. From this I went on to a lead plaster made from stearic acid. This I saponified with caustic soda. I read into my testimony a note which I kept in a note book at the time:

> "Experiments on cylinders December 24, 1892. Mixture #1–CT5 plus ST16 plus CE8 plus CS10. ST added to CT, melt ST and CT slowly, well stirred, add CE, then add CS slowly. Keep temperature 400 deg. F (about) for sufficient time.

Close grain, good general texture, but seems soft.
Some tendency to oxidize in air, very little scratch."

In this formula CT represents oxide of lead commonly known as litharge. ST is stearic acid, CE is ceresin or ozokerite, CS caustic soda.

Q. 4. What, if anything, was done with this last named formula?

A. We used this formula right along in work with the American Graphophone Co. in making sound-record blanks. The blanks which were made up were used first in a small cylinder with paper ends made to fit the chucks on the graphophone; afterwards it was made into what was known as a P blank, and was sold to the Columbia Phonograph Co. of Washington, D. C., which was not then connected with the American Graphophone Company.

Q. 5. Did this formula represent the only experiment you made?

A. This formula represented the conclusion which I reached at that time from all experiments which I had performed during the years 1891 and 1892 to the time the formula was written, which was in December of 1892. It represented the best thought of all my work at that time.

Q. 6. What can you say of the quality of this composition and what difficulty or objection had it, if any?

A. The principal objection to this formula was the tendency to oxidize, that is, after standing for a certain length of time upon the shelf or in the factory there would be a cloud or a moldy appearance come over the surface of the record. This injured the record by causing a great amount of scratch to appear in the reproduction. Outside of this, the formula gave a very good recording and reproducing blank.

Q. 7. Was this difficulty overcome, and if so, how?

A. It was overcome by continued experiments; by consulting with various chemists and experimenters that I could find; and by observing the effects of different methods of making up the formula in varying proportion. The result of all this work is found in my patent No. 606,725, dated July 5th, 1898, application for which was filed on November 27th, 1896.

Q. 8. You have spoken of consulting with chemists. With whom did you consult; and what did they contribute?

A. I consulted with a number of chemists in Bridgeport in various drug stores. I consulted with a chemist in Hartford; with a man in New York named English who was at that time keeping a drug store; with the proprietor of the Perfumer's and Soap Maker's Journal in Chicago; with a chemist in Evansville, Ind., Mr. Adolph Melzer; and with others whom I thought might assist in overcoming the principal difficulty which I had, that is, the sweating or molding of the blank. Among others was the E. F. Jones Chemical Company in New York and it was through the E. F. Jones Chemical Company that I wrote to Mr. Gathman, proprietor of the Perfumer's and Soap Maker's Journal Company in Chicago.

Q. 9. What did the various druggists in Bridgeport contribute, if anything?

A. They contributed practically nothing, they knew very little about the wax and did not help me, except in the suggestion of the making of lead plaster.

Q. 10. What, if anything, did the chemist in Hartford contribute?

A. Nothing. He advised me that it was not in his line of work and that I had better seek some soap maker who would be better posted in that line of work than he was.

Q. 11. What, if anything, did the E. F. Jones Chemical Company contribute?

A. Nothing except referring me to Mr. Gathman of the American Soap Journal and Perfumer's Gazette of Chicago.

Q. 12. What did Mr. Gathman or his paper contribute, if anything?

A. He did not contribute anything toward the formula except to advise me the best way to obtain assistance was to advertise for a competent man in his paper, and state in such advertisement just what I wanted. The advertisement was placed in his paper and in response I obtained several letters, among others from a Mr. Adolph Melzer, a soap maker and chemist of Evansville, Ind.

Q. 13. Did the suggestions of any of these chemists or experimentalists whom you consulted seem to be of any value to you in your work, or did you use them in any way?

A. I did not consider the suggestions of any of the people I have mentioned of any value except those of Mr. Adolph Melzer. I entered into correspondence with him, and began experimental work with him at that time.

Q. 14. What information did you give Mr. Melzer at this time?

A. I gave him the formula which I was using, and all the knowledge which I had in regard to cylinder making; I sent him a number of samples of finished cylinders; of the wax made up in cakes; and also sent him samples of the raw materials which I used to make these cylinders, and full description of every kind to enable him to produce the product.

Q. 15. What information or knowledge did Mr. Melzer seem to have of the problem or difficulties?

A. Mr. Melzer appeared to be, and I felt that he was, a competent, experienced soap chemist. He seemed to be well aware of the difficulties of "clouding" or "smoking" which appeared in fine (or toilet) soap making just as it did in this work, and appeared thoroughly familiar with and accustomed to handling the material which we were using in making the soap composition. He was familiar with all details of soap making for laundry purposes and toilet purposes, but he had no knowledge of soap as used for record making. This was an entirely new field for him.

Q. 16. What did Mr. Melzer first do with the formula?

A. After I sent him the material and the full description of what I was doing, Mr. Melzer went to work and sent me from time to time samples of his work for my inspection and criticism. I suggested to him various things to be done. For instance, a softer or harder wax, one to be made less or more granular, one that would show a better fracture on breaking, etc.

Q. 17. What was the results of the samples which Mr. Melzer sent you?

A. He finally sent on some samples which seemed to me to be worthy of adoption and I wrote him to that effect and Mr. Melzer then sent me the formula by which he made these. The only change in it from what I had been using seemed to be in the substituting of the *oxide of aluminum* for the *oxide of lead.* After trying this formula for some time I did not get very good results. In fact, not much better than those I had been having from the formula which I used myself and after some further negotiations and correspondence I concluded the best way would be to go to Evansville and go to work on the formula with Mr. Melzer. This I did, and spent some time in his factory at Evansville working on this formula. I then brought back the results of this work and started again to make cylinders from the formula. We still had a great deal of trouble with various points, and I finally decided to have Mr. Melzer come to the factory so that we could again go over the matter together. This was done. Mr. Melzer spent some two or three weeks in the factory and the formula was finally whipped into the shape in which it appears now in my patent which I have heretofore mentioned.

Q. 18. Why, if you know, did Mr. Melzer undertake this work.

A. Mr. Melzer undertook this work under employment. It was understood and agreed that he would be rewarded for the work that he did, and before the formula was turned over he was paid by being delivered two graphophone outfits and records and cabinets to go with them, amounting to $500 worth of material.

Q. 19. Did you experiment with him at Evansville and afterwards in the factory in Bridgeport?

A. I did. I carried on the experiments side by side with him and the work was done by both of us at all times in free consultation over every point that arose.

Q. 20. What was the purpose of putting in the ceresin or hydrocarbon?

A. It was for the purpose of preventing the oxidization or the molding or sweating of the blank which of course spoiled the record which was placed upon it, and to temper or soften the mixture.

Q 21. What do you know of the tendency of the oxide of aluminium and of the oxide of lead in this regard?

A. The oxide of lead forms a compound which is hygroscopic, that is, it attracts the moisture of the air and forms a cloudy or sweaty appearance over the surface. Oxide of aluminum apparently forms a non-hygroscopic compound, that is, one which does not easily attract moisture, and the surface of the blank remains bright and the record is not injured.

Q. 22. Do you know how Mr. Melzer came to use the oxide of aluminum instead of the oxide of lead in your formula?

A. Because I informed him that the difficulty was the sweating caused by the oxide of lead, and from his knowledge of the oxide of aluminum he knew that it would not cause sweating and he substituted that in the formula and obtained the result, that is, a blank which did not sweat or mould when brought into a hot, moist atmosphere.

Q. 23. When Mr. Mtlzer disclosed to you that he had used aluminum or oxide of aluminum in making up the samples he had submitted, was it a new thing to you?

A. It was in this particular form, but I had used alum in connection with sal soda before this. I had used sal soda and alum together in making the composition and had saponified the same. As the carbonate of soda, when united with the alum, produced in the mixture hydrate of aluminum, the same chemical results followed that we obtained from Mr. Melzer's formula where the hydrate of aluminum was added direct.

Q. 24. Mr. Melzer states that he suggested to you the use of lye instead of a dry powder, that is, that the caustic soda should be put into the mixture in the form of a caustic soda lye, rather than in the form of a dry powder; what have you to say to this?

A. Mr. Melzer did insist upon the point that the proper way of uniting the caustic soda with the stearic acid and the aluminum hydrate or the metal was in the form of a lye. Of course it was well known to myself and to my assistants in the factory, that the common method of making soap throughout the world was to add the caustic soda in the form of a lye. The mixture we were making was nothing more than a stearic acid soap, but we had preferred to add caustic soda in the dry powder for the sake of convenience and ease in manufacture.

Q. 25. Have you read the testimony of the defendant's witness English; and if so, what have you to say regarding the samples which he says he submitted about two or three years after the spring of 1890?

A. The samples submitted by Mr. English at the time he states were of no value. They were harsh, they had a very high melting-point, and were apparently of a substance that was of such coarse granular nature that no cut could be made in it. I did not give them serious consideration at the time.

Q. 26. Defendant's witness Dodge refers apparently to these samples and says that they had a strong acid odor, which suggested to you acetate of lead. What have you to say to this?

A. It is possible that I did make such a remark. I probably would if they had had an acid smell, as I had been experimenting with acetate of lead for a long time, and the peculiar vinegar odor which comes from such a mixture was a familiar one to me, and I would probably have suggested that they contained acetate of lead if I found that odor there, though I do not recollect the circumstances now.

Q. 27. What were you using the acetate of lead for, in these experiments you speak of?

A. I was using the acetate of lead to obtain the metal lead in the composition as a preventative of the crystalization of the resulting compound, the same as I had used the oxide of lead in the formula which I have heretofore mentioned.

Q. 28. I call your attention to Mr. English's deposition regarding the transaction which took place, about November, 1894. Please state the facts in this matter?

A. After the first time I met Mr. English (when he submitted samples which were so unsatisfactory), I paid little attention to his position; but he came back several times and finally in 1894 brought up some samples which appeared to be very much better than anything that he had heretofore shown.

Q. 29. What time in 1894 was this?

A. It was sometime in the Fall. I don't remember the exact date.

Q. 30. Was this before or after you opened the correspondence with Mr. Melzer?

A. It was after I opened the correspondence with Mr. Melzer.

Q. 31. What, if anything, did you tell Mr. English about Mr. Melzer?

A. I did not tell him anything about Mr. Melzer, in fact, I was careful not to mention anything about him or his work upon the cylinder material to Mr. English.

Q. 32. Mr. English says that before he delivered the formula you told him the company had no use for it now, as it had obtained one from a western soap chemist; and that after he gave you the formula you told him that you couldn't get along without his formula as you did not have the western man's formula. What have you to say to this?

A. Nothing of the kind occurred. The exact statement of the facts were that I wrote Mr. English a very short time after he sent me his formula a very vigorous letter in which I directly and openly charged him with fraud which I believe he is guilty of. I made it as strong as I possibly could. To this letter he answered that he had given me something that was very valuable, and I again told him that I did not think he had but I thought he had sold me a gold brick. This letter I afterwards withdrew as I thought he had sold me a gold brick. This letter I afterwards withdrew as I thought it might be just as well to have him friendly as to have him unfriendly. I did not consider him very safe anyway; being one who had attempted to sell out his former friends, and would not of course hesitate to sell us out, and that the first thing to do was to keep him pacified, so I wrote him the letter in which I practically apologized for writing as I had previously done. These are the facts in the case.

Q. 33. Mr. English states that he does not remember the proportions used but that the ingredients named in the formula he gave you were stearic acid, partly saponified with caustic soda, acetate of aluminium then added, and finally ceresin. Did you try this formula; and if so, with what results?

A. I did try this formula with very good results. The mixture appeared to be of very close grain and just about what we would like to have for a cylinder material, but upon letting it stand for any length of time, especially in a hot, moist atmosphere, the surface would become very badly clouded, in fact in a great many cases worse than the formula which we were using which contained the oxide of lead. It was, therefore, of very little use to us, and we never have used this formula in any way, except experimentally.

Q. 34. Mr. English produces a telegram purporting to be from you and dated Nov. 2, 1894. He says he thinks this was the occasion of your meeting him in New York, and that he made up a batch in your presence, introduced you to the various supply houses, and delivered the formula to you. Did all this take place on the same day. *A.* It did not.

Q. 35. Mr. MacDonald, you seem to have been very persistent in developing and perfecting this composition, why was this?

A. My pecuniary compensation from the company depended upon the output of the company, and as long as cylinders were purchased in the open market of course I obtained nothing from this source. Further, I had an agreement with the company by which I received a royalty of so much per record that we made in the factory; but of course this necessitated our making blanks also. And in addition to that, the pride of the inventor in obtaining successful results of his work.

Q. 36. Did you disclose these facts to English or Melzer?

A. I disclosed them to Mr. Melzer, but I do not know that I ever discussed the matter with English. My impression is that I did not.

Q. 37. Mr. English states that you bought the formula out of your own pocket. Is that correct?

A. It is correct. I paid for the formula myself and was never reimbursed for the amount paid him.

Q. 38. The defendant's witness Dodge says that at the beginning of the Spring of 1893 you were experimenting and he was assisting you in making the metallic soap blank, and he says that it was noticed that the increase of caustic soda raised the melting-point of the composition. What have you to say to this?

A. I had discovered that we had obtained very much better results by only partial saponification than by complete saponification, and I was therefore careful not to add too great an amount of caustic soda. I had also observed that as caustic soda was added ,the melting-point was raised. This indicated a more complete saponification of the material, which is to be avoided to obtain the best results.

Q. 39. Defendant's witness Fargo says that during the time that he was in charge of the Cylinder Department the Graphophone Factory had no facilities for heating the composition over 320 degrees because you had only a steam heating device; and that the boiler had only about 130 pounds pressure, although it was nominally of 145 pounds pressure. What have you to say about this?

A. This is only partially true. We heated our material over coal fires, we heated it over gas fires, and we also experimented at the time mentioned with a steam plant. The steam plant was a failure for the reason we could not get sufficient heat to make good material, and it was only used a very short time. It was taken out and gasheated kettles were put in the place. We made practically no composition with the steam plant for the reason that we could not get sufficient heat to make good material.

Q. 40. Did Mr. Dodge participate or was he present during all the experiments that you were making on the composition while he was at the Factory?

A. No, he was not. In fact, he was present at very few of the experiments that I made. I had a separate room for this work and usually gave him the results of the experiments, though of course sometimes we carried on the experiments together in the regular melting pots when we found trouble with the mixture. When a batch would come through and showed that it was wrong, we would put it back and melt it over again, we then added more or less of the various ingredients, trying different methods of heating it to obtain, if possible, a better result.

Q. 41. The same question as to Mr. Fargo when he was in charge?

A. The same thing is true in regard to Mr. Fargo though in a greater degree. I am quite certain that I gave Mr. Dodge more information than I did Mr. Fargo at any time.

Q. 42. Was the composition that you were making at the time Mr. Storms came, satisfactory?

A. It was satisfactory; but the composition which Mr. Storms made seemed, in the opinion of some of our people in Washington, to be of a softer material than what we were making, and so we were instructed by them to make the record by Storms' method. This we did for a considerable time, until finally we were all satisfied that there was no improvement in it. We definitely abandoned it then, and went back to the formula of my patent which we are using to this day.

Q. 43. Why was it that you were willing to take the formula and samples from English? And again you were willing to obtain assistance and information from Storms, etc.

A. We had had much trouble with formulas in the past and my endeavor was to obtain information from every quarter we could and to get as many answers in as possible, so that if I had trouble with one formula possibly some suggestion or hint of another would assist me. In other words, it was the getting all the information upon our part that we possibly could, in case of difficulties arising in future as they had in the past.

Q. 44. In what matter was the determination reached as to what composition should be used?

A. The composition, after I had made it as good as I could, was submitted to our Executive Office in Washington,—Mr. Easton being the president of the company at that time as he is now. Their opinion was based very largely upon the opinion of the users, salesmen, and others who used our machines and records.

Q. 45. Did you consult with Mr. Easton in regard to the composition that you made?

A. I did. I consulted with him at all times and submitted him samples both in the form of blanks, and in the form of blanks with records upon them. His opinion was the final judgment as to whether the composition was to be used or not.

Q. 46. In your opinion both then and now, how did the composition which you had developed before Storms arrived compare with the Storms' composition.

A. In my judgment, the composition which we were using at the time Storms came, and the one which we have used since he went away, is superior to that which he gave us, both in regard to the ease and certainty of manufacture and the results obtained from it.

Q. 47. Why did Storms leave the factory?

A. On account of continued and persistent intoxication.

Q. 48. Did Storms represent to you or was it represented to you that Storms had the Edison formula?

A. No. Von Der Lippe who worked in our sapphire room recommended him as a good wax-maker. He submitted samples and on the showing he made through these, and from the report from our home office in Washington, he was employed.

Q. 49. In what way did the formulas which you had worked up and invented, and which you gave to Dodge, Fargo, Melzer, Gathman, and Storms, differ from your patent?

A. They did not differ at all. I conceived this invention to consist essentially of a preparation of stearic acid. This is first saponified by caustic soda or sal soda. Second, it is rendered non-crystalline by having added a metal, such as *oxide of lead, acetate of lead, oxide of aluminum, acetate of aluminum,* or *oxide of zinc.* Third, it is tempered and rendered non-hygroscopic by the addition of a hydro-carbon wax such as paraffin, ceresin or ozokerite. In other words I gave them the four corners of the structure, a complete structure too. They were (1) *Stearic Acid.* (2) *A Metal.* (3) *A Saponifier.* (4) *A Hydro-carbon.*

The metal I used worked all right and made a good blank. After a time it developed a fault, Mr. Melzer suggested: "If you'll change the metal to another oxide, this fault will disappear." I did so and the fault was eradicated. No other change was made. The structure still stands as it was before; viz.:

1. Stearic Acid.
2. A Saponifier.
3. A Metal (non-crystallizer).
4. A Hydro-carbon wax (non-hygroscopic).

Q. 50. What precautions, if any, were enjoined upon persons in charge of, or connected with, the making of the cylinder compositions referred to?

A. Strict secrecy was enjoined. Only the party immediately in charge of the work knew the formulas. The principal part of the mixture was made in a room separate from the rest of the work, and no one was permitted in this room except the man in charge of the mixing.

Adjourned to next Friday, May 17, 1907, at 10 A. M., same place.

BRIDGEPORT, Conn., May 17, 1907.

Met pursuant to adjournment.

Present—Counsel as before.

By Mr. Massie—Complainant's counsel gives notice on the record that Claim 10 of the Macdonald patent No. 606,725, here in suit, is withdrawn.

CROSS-EXAMINATION of the witness MACDONALD, by Mr. DYER:

xQ. 51. What was the nature of the experimental work taken up by you in April, 1891; and particularly was it of a chemical nature? *A.* It was of a chemical nature, in a measure.

xQ. 52. Did it relate to recording-compositions?

A. I did some experimental work that related to recording-compositions.

xQ. 53. Prior to that time had you had any chemical experience?

A. Only such as was necessary in High School course. I was an assistant teacher in High School before leaving home, California, in 1887. Part of my work was the teaching chemical classes.

xQ. 54. In answer to *Q.* 3 you refer to the Edison cylinder composition. What was the character of the Edison composition at the time of your conversation with Mr. Lombard?

A. As far as I could judge by outward appearances, it was similar to the Edison formula of to-day.

xQ. 55. And so far as you know to the contrary, it was the same composition in 1891 that it is to-day?

A. As far as I know, it was.

xQ. 56. Regarding your conversation with Mr. Lombard, did he tell you, or did you know, that at that time the Edison Phonograph Works had an exclusive manufacturing contract with the North American Phonograph Company to supply Edison phonographs and blanks to that Company?

A. I did not know of that contract, nor did Mr. Lombard tell me of it. On the contrary, he gave me the very strong opinion that the North American Phonograph Company was free to get both machines and cylinders where they could get them manufactured the most cheaply. I judged this because I personally took a phonograph at Mr. Lombard's instance to the Colt's Manufacturing Co. in Hartford, to get them to bid upon the manufacture of 10,000 of them.

xQ. 57. Did Mr. Lombard explain why he should have come to you for the purpose of getting up compositions that would make the North American Company more independent of the Edison people? *A.* He did not.

xQ. 58. Mr. Lombard, as I understand it, wanted you to produce, if possible, a composition which would have the characteristics of the Edison blanks?

A. I do not recall any definite instructions in that line, it is to be presumed that Mr. Lombard did ask for something equally good or better. It is my impression that he told me that the blanks that they were then using were made under some secret process of which neither he nor Mr. Lippincott, the President of the Company, knew anything. I am very sure there was conversation of this nature; whether it occurred at this particular time or not, I would not be sure, though it occurred very close to it.

xQ. 59. Your object, however, was to make a composition that would possess the physical characteristics of the Edison blank?

A. As I recollect the conversation at this time, I do not recollect that that was gone into at all further than I have stated. Mr. Lombard probably asked for something equally as good, but as I had made no experiments at that time, I cannot say that I had any definite idea then about the matter other than to begin a series of experiments such as I could with the object of producing a successful recording blank.

xQ. 60. You say that Mr. Lombard previous to your conversation with him "Had had a chemist make some experiments according to a patent which they had obtained from Mr. Edison." Did he tell you which Edison patent this was or what it disclosed?

A. I do not recall anything of that conversation, beyond the distinct recollection that Mr. Lombard did say, during the same conversation about which I have testified, that he had had such experiments made, and that they were a failure.

xQ. 61. At that time, you were, I presume, generally familiar with most of the patents in this art including those of Edison were you not?

A. No, I cannot say that I was familiar with the patents; my work up to December of 1889 was that of inspector of the North American Phonograph Co., and from Dec. of 1889 to July of 1890, I was stationed at the factory of the American Graphophone Co. to receive the graphophones manufactured for the North American Company. My experimental work, therefore, began about July, 1890, though I had done a little in that line in Philadelphia.

xQ. 62. When were you associated, or connected with Mr. Edison, in Orange, if you ever were?

A. I was requested to go to Orange by Mr. Lippincott, the President of the North American Phonograph Company, in July, 1889. I went there for the purpose of having made a phonograph with a shaving knife in the rear of the machine; also with a recorder with a "floating" diaphragm. I was there until about the middle of September when the experimental machine was completed. There were two of these machines made, to my recollection.

xQ. 63. Were you employed in the laboratory or in the Phonograph Works?

Well, I was not employed at the Edison plant at all; this work was done in the laboratory under the immediate supervision of Mr. Batchelor. While at the Edison plant I visited the Factory a number of times in company with Mr. Ballou who was at that time mechanical engineer of the Phonograph Works.

xQ. 64. During the time that you were located at the laboratory were you informed by any one concerning the Edison composition, or did you ascertain anything concerning the make-up of the Edison composition? *A.* I did not.

xQ. 65. At the time of your conversation with Mr. Lombard, you were aware, were you not, that Mr. Edison had suggested in patents the use of metallic soap as materials for the manufacture of recording compositions?

A. I was not aware of any patent at that time. Mr. Lombard's statement that there was a patent, was the first that I knew of it.

xQ. 66. Did you have knowledge at that time from any other source as to the suggestion by Mr. Edison of the use of metallic soap for the manufacture of recording-composition?

A. My recollection of the matter in those days was that the Edison composition was a secret, and not patented. I recollect that I was somewhat surprised to learn that there was a patent on a composition. But as I learned at the same time that I received Mr. Lombard's statement that it was not the composition which was used, and that as a matter of fact it was of no value, I did not pay much attention to it.

xQ. 67. Did Mr. Lombard tell you what composition or material was described in this patent to which you have referred?

A. He did not.

xQ. 68. After your conversation with Mr. Lombard what prompted you to immediately attempt the manufacture of a lead soap?

A. I do not recollect clearly, but think that it was from a suggestion by Mr. Billings, who was at that time a druggist in Bridgeport; the exact circumstance bringing it about was my showing to him a mixture that I had made up consisting of carnauba wax, ozokerite and paraffin, and my recollection is that he said it reminded him of lead plaster. I looked up lead plaster in a chemistry which I happened to have and found out how it was made, and made some. These cirucmstances are somewhat hazy in my mind, though I think this fairly describes the origin.

xQ. 69. You did not know then, at that time, that Mr. Edison had previously suggested the use of lead-soap as a recording-composition or material? *A.* I did not know it.

xQ. 70. And you did not know at that time that the Edison composition was in the nature of a soap, or a metallic soap?

A. I did not, I was under the impression that it was made of wax. The newspapers of that time were full of a great many stories in which it was told that experts had been sent all over the world by Mr. Edison, and that they had gathered these waxes together and from this the secret composition was made. As this was never contradicted in any way, I presumed that this formed the cylinder.

xQ. 71. You state that you first made a lead soap, or "lead plaster." Do you remember how this material was made?

A. I do, in a general way. It is made generally by boiling a quantity of litharge or oxide of lead with olive oil and water. That which I made was according to the recipe as given in Attfield's Pharmaceutical Chemistry.

xQ. 72. Will you kindly produce the note book containing the extract under date of December 24, 1892, quoted in answer to *Q* 3? *A.* I hand you the book.

xQ 73. I notice in this note book, under date of December 28th, apparently 1892, the statement: "It resembled the Edison cylinder in appearance very closely." Apparently at this date you were attempting to imitate the Edison blank, were you not?

A. I was endeavoring to produce a blank which would give the best service I could. At that time the Edison blank was unquestionably the best recording-medium in use, especially for the only thing in which there was any money at that time, that is, the making and selling of musical records. Naturally this was taken as representing the highest state of the art at that time.

xQ. 74. And I understand that you have testified that the Edison composition of to-day is, so far as you can judge, the same as it was then?

A. As far as I could judge by outward appearance, it is similar.

xQ. 75. Under date of August 2, apparently the year 1894, I find in this book the statement that a certain material which you appeared to have made, or had made for you, "is fine, very much the same as Edison's Mixt." I take it that this means that here again you were seeking to reach the standard which you state was set by the Edison blank?

A. This statement you have quoted was written by an employee, Clarence Fargo. Just what his idea was at the time of writing it, I do not know. I have no knowledge of this beyond the statement here in Fargo's writing.

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xQ. 76. In the same note book, under date of July 7, 1894, I find the statement that a certain composition, which appears to have been made, "has not that peculiar quality found in Edison Mixt." and that a certain other composition was "a little harder and more like Edison Mixt." Are these your entries, and can you explain the same?

A. These are also the entries of Mr. Fargo, and probably represent his notes at that time of something he had made.

xQ. 77. In the same book, under date of July 6, 1894, concerning another composition, I find this statement: "Smells while cooking like Edison Mixt." and has same appearance in liquid form as Edison Mixt. Is this your entry, and can you explain the same?

A. It is not my entry, it is that of Mr. Fargo, and I cannot explain it further than what appears upon the record.

xQ. 78. Under date of September 1, 1894, I find in this notebook the statement that "Mr. Macdonald says it has just the smell of Edison Mixt. and looks like it with one exception, that is the polish on the surface exposed to air." Can you say anything further in explanation of this statement?

Objected to as relating to hearsay and therefore incompetent.

A. I do not recollect this incident, and can add nothing to the record which Mr. Fargo has made here.

xQ. 79. Having reference to the formula as developed by your experiments up to December 24th, 1892, referred to in your answer to *Q.* 3., do the figures following the abbreviations of the materials represent the weights of materials used?

A. Represent the weights avoirdupois.

xQ. 80. Does this particular formula as developed by the experiments up to December 24th, 1892, represent the four characteristic features of the composition mentioned by you in the same answer? *A.* It does.

xQ. 81. That is to say, as I understand it, it represents the composition which consists of first a quantity of free stearic acid, second, about the same amount of stearic acid saponified as with caustic soda or sal-soda, third, a small percentage of some other metal, and fourth, some hydrocarbon wax?

A. It does represent that.

xQ. 82. Is it not a fact that ten parts by weight of caustic soda, are much more than enough to completely saponify 16 parts by weight of stearic acid?

A. Probably if the caustic soda were chemically pure. Caustic soda here represented was the ordinary commercial article, which, as is well known contains a very large percentage of water. The caustic soda which we used at that time was about what is known as "72", which meant only 72 degrees caustic soda.

xQ. 83. That is to say, 72% of the saponifying effect of chemically pure caustic soda?

A. That is my understanding of it.

xQ. 84. Assume then, that in the formula of December 24th, 1892, you used 7.2 pounds caustic soda (pure), to 16 pounds of stearic acid. Would not that be normally more than enough to completely saponify the stearic acid?

A. I am not able to answer that question without looking the matter up.

xQ. 85. In the patent in suit it is stated that with a 37.5 degree lye, 85 pounds thereof will saponify 40% of 408 pounds of stearic acid. With these figures as a basis can you state whether or not 7.2 pounds of pure caustic soda would be more than enough to completely saponify 16 pounds of stearic acid?

A. I could not, without proper consultation of records and experiment.

xQ. 86. You are not entirely sure, then, that this formula of December 24th, 1892, contains any free stearic acid at all?

A. I am quite certain that it did contain free stearic acid, otherwise it would not liquify when melted.

xQ. 87. The single fact, then, that you made a composition that could be melted leads you to assume that the stearic acid was not entirely saponified? *A*. That did.

xQ. 88. Why do you assume in regard to this composition of December 24, 1892, that there was "about the same amount of stearic acid saponified" as existed in the free state?

A. Owing to my recollection of the behavior of the material when melted and molded.

xQ. 89. Kindly explain how the behavior of the material led you to the assumption that 7.2 of caustic soda would effect substantially a 50% saponification of 16 pounds of stearic acid?

A. I do not know that I formulated such an idea as you have expressed in your question in my mind at any time. In the multitude of experiments that were made along this line I found that as I increased the quantity of caustic soda the melting-point, or rather liquifying-point, was raised, and that a large amount of caustic soda would give a sticky mass that could not be molded at all.

xQ. 90. I have understood you to say that you determined that the composition should have four characteristics as set out in your answer to *Q*. 3, of which you have given the composition of December 24, 1892, as an example. Am I to understand regarding this composition that you only determined its ultimate molding qualities?

A. I did not give the experiment of December 24, 1892, quoted in the last part of my answer to *Q*. 3, as an example of the composition indicated in the last part of first paragraph of the same answer.

xQ. 91. In view of your last answer, do you wish to make any correction in your answer to *xQ*. 80?

A. I do not, though I will say that I am not certain just now that these figures given represent weights of the same unit. My impression is now, looking at this, that at this time we purposely made these figures arbitrary, and that many of the experiments that we made at that time were with arbitrary symbols, as in this formula I have used "CT" to represent litharge or oxide of lead. It was an arbitrary designation. The fact that I am certain of, however, is that this mixture did give the results which I have described, or substantially that. It was the mixture that was given by me to my assistants, Mr. Fargo, and Mr. Dodge, as a basis on which their work should be carried on. I can say in explanation at this point, that I had two note books which were kept more elaborate than these. One of these was one of my own, another was sent to me by another experimenter in this line. Both of these note books disappeared, and I never obtained any trace of them, though I have seen a quotation from one of them in the testimony of a witness in this case.

xQ. 92. You have reference to Mr. Fargo, have you?

A. I have.

xQ. 93. Do I understand you to say that the figures of weights given in connection with the formula of Dec. 24, 1892, may be arbitrary? *A*. That is my impression.

xQ. 94. If those are arbitrary figures can you give the correct amounts of this formula?

A. I am led to the belief indicated in my last answer from the consulting of a note book which was also kept by Fargo at this time, a little later in which I think the weights were certainly given in ounces, and I find that in every case without any note being made there is a very marked difference in the amount of materials used. My impression now is as I have stated, I cannot answer more completely until I have verified this impression with consultation of further records. This I can do, but I cannot at this time give you the exact figures.

xQ. 95. Is it not a fact, Mr. Macdonald, that at the present time you are not able to say that this formula of Dec. 24, 1892, does embody the four peculiarities of the composition which you refer to in an earlier part of your answer to *Q.* 3?

A. I am not able at this time to say positively that this particular formula does contain those things indicated in my statement in the first part of my answer. It was not my intention to introduce this formula as an example of it, though I thought that it did fulfill it from my recollection of its behavior.

xQ. 96. If we attempt to saponify stearic acid by caustic soda, in the presence of oxide of lead, will not the stearate of soda formed be decomposed to result in the production of stearate of lead or lead plaster?

A. I am not sufficiently an operating chemist to answer that question.

xQ. 97. From all that you can say to the contrary, then, the formula of Dec. 24, 1892, may be nothing more than stearate of lead mixed with ozokerite?

A. I cannot give the entire negative side of the case, the positive side was that I did use stearic acid, saponified with caustic soda. To this I added oxide of lead, and a quantity of a hydro-carbon wax, and I did produce a mixture which was used by the American Graphophone Company, and by the Columbia Phonograph Company as a recording material, subsequent to the date here given, Dec. 24, 1892, and up to about the first of 1895. As to the exact chemical re-action which took place, I am not qualified to fully describe.

xQ. 98. Nor as to the exact chemical result obtained by this formula?

A. No, I was more interested in the commercial results.

Adourned to to-morrow morning at 9.30.

BRIDGEPORT, CONN., May 18, 1907.

Cross-examination of the witness MACDONALD continued.

Present—Counsel as before.

By Mr. DYER:

xQ. 99. In answer to *Q.* 4. referring to the composition of Dec. 24, 1892, you state that it was used "right along in work with the American Graphophone Company in making sound-record blanks." How extensive was this manufacture?

A. We supplied the Columbia Phonograph Company with, I think, 4000 blanks during the year 1893; at least their order was for 4000. Whether they were all shipped to them or not, I could not say now.

We also supplied the United States Phonograph Company of Newark, with a considerable quantity. How many I could not say at the present time. My recollection is rather dim upon that subject, but my best impression is that we made about 5000 blanks according to this formula during that year.

When I say "according to this formula" I do not wish to be confined to the exact figures that are indicated in the note which I read into my testimony. This was given as the first formula which I happened to have in my possession at that time which contained what I considered to be the full frame work of my composition. The ingredients were varied and constant experimenting was done with it in changing the proportions as shown in the succeeding pages of the note book. I would say further in explanation of the formula of Dec. 24, 1892, that the figure 5 following "CT" (the arbitrary symbol for oxide of lead) indicates ounces; also, in the case of the figure 10 following "CS" (caustic soda). In the case of the stearic acid and the ceresin (ST and CE), the figures 16 and 8 indicate pounds.

xQ. 100. Were the 5000 blanks, more or less, which you sold to the Columbia Phonograph Company, in 1893, put into use publicly by the Columbia Company?

A. They were so far as I know. I do know that a large number of them were sold. Also those that were sold to the United States Phonograph Company were sold.

xQ. 101. And these blanks were sold alongside of the Edison blanks, were they not?

> Objected to as incompetent since it does not appear that the witness has or could have any knowledge on the subject.

A. They were sold by the Columbia Phonograph Company and the United States Phonograph Company, but whether alongside or before or behind them, I could not say.

xQ. 102. These records, or blanks, which you say were sold to the Columbia Phonograph Company in 1893, were supplied to the trade in turn by the Columbia Company the same way that the Columbia Company supplied Edison blanks to the trade, is that correct?

> Same objection.

A. I am not competent to answer, I do not know how they disposed of their products at that time, my supposition is that they did sell them the same as all their products were sold.

xQ. 103. And commercially speaking they were a failure, were they not?

Objected to as indefinite.

A. We received complaints from both the companies that the blanks would "sweat" or "blue mold," as it was termed. This meant that when exposed to a hot, moist atmosphere the surface became covered with a film, due, we presumed, to the presence of moisture. This, of course, injured the record. Outside of this one defect, the blanks were perfectly satisfactory in every way.

xQ. 104. Were not these blanks returned to the Graphophone Co. because of this defect?

A. Some of them were, not all of them.

xQ. 105. Was it ever your practice, or the practice of the Graphophone Company, to mold up blanks composed wholly or partly of broken Edison cylinders?

A. Only for experimental purposes. We never made blanks for sale in this manner.

xQ. 106. Did you make use of Edison cylinders or blanks for making records in 1893 or 1894?

A. We, the American Graphophone Company, made no records in that time.

xQ. 107. Do you know of your own knowledge that the Columbia Phonograph Company, as early as 1893 made extensive use of Edison blanks?

A. During the greater part of 1893 the Columbia Phonograph Company was practically an agency of the Edison Phonograph Company, and in no way connected with the American Graphophone Company, and I presume that they used phonograph materials both in machine and records.

xQ. 108. I have particularly in mind the statement made in your letter of Dec. 22, 1894, to Mr. Melzer, in which you said: "I worked out the formula I sent you which makes the wax that 'sweats' some time ago. At that time the company were using the ozokerite cylinder for commercial purposes, and were buying phonograph cylinders for the purpose of finer work." What was the "work" for which the Company was buying the phonograph cylinders?

A. That letter had reference to the Columbia Phonograph Company, which at the time the letter was written, in 1894, had become the sole sales agent of the American Graphophone

Company. The Columbia Phonograph Company were, as I have told, using the phonograph cylinders for making musical records.

xQ. 109. When you used the expression "At that time" did you mean that the Coumbia Company was using Edison cylinders when you worked out your formula?

A. The American Graphophone Company, of which I was an employee, made no records at that time, nor do they make any to-day. The Columbia Phonograph Company have always made the records which we have used. By this I mean, of course, the original recorded records. It was not until 1896 (possibly 1895), when we began duplicating that any records of any description were made by the Graphophone Company under my direction, or under my charge. All the records, all the blanks rather, that I had made, and which are referred to in this letter to Mr. Melzer, were sent to the Columbia Phonograph Company in Washington, and there used by them.

xQ. 110. When you wrote Mr. Melzer on December 22, 1894, you knew that the Columbia Company for some time had been a user of Edison blanks? *A*. I did.

xQ. 111. Did you know how extensively the Columbia Company had used Edison blanks?

A. They used them from the time they commenced business in Washington, in 1889, up to this time. Just what quantities they used, I do not know.

xQ. 112. You have said that blanks that were made in accordance with the formula of Dec. 24th, 1892, were sold by the Graphophone Company to the Columbia Phonograph Company in 1893. Did you continue to make these blanks during the year 1894? *A*. I did.

xQ. 113. Did they continue to develop the same "blue mold"?

A. Only when submitted to conditions of heat and moisture. Ordinarily there was no trouble with them. This defect, however, of sweating was one that was occuring very frequently, so much so as to give cause of complaint from customers; and it was for this reason that I sought methods of improving the formula to eliminate this difficulty., as this seemed to be the only difficulty with them. In all other respects they were entirely satisfactory.

xQ. 114. In all other respects did you regard them as satisfactory as the Edison blanks? *A*. I did.

xQ. 115. Did the Columbia Phonograph Company use your blanks exclusively in 1893 and 1894?

A. I could not answer, could not say.

xQ. 116. How extensive were the sales of your blanks to the Columbia Phonograph Company in 1894?

A. I could not say. My impression is that we made more in 1894 than we did in 1893.

xQ. 117. Has not the American Graphophone Company a record of its manufacture and sales of your blanks during the years 1893 and 1894?

A. I could not answer that. Such records were undoubtedly made at the time, though they are not in my possession.

xQ 118. In whose possession are they?

A. If they are in existence they are probably in the possession of the Executive Office of the Company in New York.

xQ. 119. Are you quite sure that this formula of Dec. 24th, 1892, was used for the manufacture of blanks for sale to the Columbia Phonograph Company during the years 1893 and 1894?

A. This particular formula was used some of the time, many other formulas were also used. They were all, however, substantially the same as the formula here given, the only difference being in the variation of the proportions of ingredients, or the kind of lead compound used to make the stearate of lead.

xQ. 120. When did you take up the acetate of lead instead of the oxide of lead mentioned in the formula of Dec. 24, 1892?

A. The first note that I have in which I find acetate of lead mentioned, was on May 3rd, 1894, though I had evidently used it before that time. I find on page 31 of this note book, from which the formula just mentioned was taken, a note in my own handwriting at the top of the page, given to Mr. Fargo. A formula which introduces acetate of lead, and following that a large number of notes made by Mr. Fargo on variations of this formula which I gave him.

xQ. 121. What symbol for acetate of lead did Mr. Fargo use in this note book? *A*. "A1."

xQ. 122. Were the acetate of lead blanks any better than the oxide of lead blanks?

A. They were pronounced so by the Columbia people; that it, they reported there was less tendency to oxidize or "sweat."

xQ. 123. To what did you attribute the oxidization or sweating?

A. To some by-product that formed in the chemical combination of the ingredients used, and which was affected by moisture.

xQ. 124. Can you explain a little more precisely just what was the character of this blue mold? I mean physically and not chemically.

A. When the records were cut upon the recording machine, they presented a glossy, polished surface. After being exposed to moisture in a warm atmosphere, the surface became dim as though a slight film, somewhat resembling slightly-smoked glass, formed on the surface. This, of course robbed the record of its sheen, or polish; and when reproduced it was found that it tended to increase the scratch, which, of course, was an objectionable feature. It could be easily brushed away by a piece of soft cotton, and the record restored to its glossy appearance, but it was sufficiently objectionable to constitute a fault which everyone considered necessary to remedy.

xQ. 125. And you observed no difference at all as to the character of this molding or sweating between the lead oxide composition and the lead acetate composition?

A. I did; the film or sweat was of a much lighter color with the acetate of lead, and did not seem to affect the surface in the way of increasing the scratch so much; and it was considered by myself and the users that the record was better than that made of the oxide of lead. It was for this reason that we used the acetate of lead in the formula, and that was the formula that was submitted to the various chemists that I had enlisted to get rid of this difficulty, among them being Mr. Adolph Melzer.

xQ. 126. Are you able to state, when you began to commercially make the acetate of lead manufacture, how extensive such manufacture was?

A. We began using it early in 1894 and all of the cylinders that were made during 1894 were made with acetate of lead.

xQ. 127. And you regard these oxide of lead and acetate of lead formulas as embodying what you have called the "four corners" of your composition? *A.* I did and I still do.

xQ. 128. And blanks made with these compositions embodying these "four corners" were in use, or on sale in the years 1893 and 1894? *A.* They were.

xQ. 129. In public use? *A.* As far as I know they were.

xQ. 130. Regarding these formulas of yours, how long did it take for the sweating or oxidization or molding to manifest itself?

A. As I recall the matter, it never occurred in less then 10 days or two weeks time, sometimes it was not apparent for months, and only, in every case, when subjected to a warm temperature accompanied by moisture. And I will say in that respect, that all the blanks of to-day, including those made by the American Graphophone Co. and by the Edison Phonograph Co., are all subject to the same fault at the present time, though in a very much less degree than were these oxide of lead and acetate of lead blanks of 1894.

xQ. 131. In your testimony you do not draw any distinction in principle, do you, between the oxide of lead formula and the acetate of lead formula; or in other words, if one embodies your composition the other does? Is that correct?

A. I do not draw any distinction between either of these formulas or any formula which introduces a second metal and forming correctly—or what may be correctly called—a bi-metallic soap. The addition of caustic soda to stearic acid forms a metallic soap, in my opinion, because soda contains metal sodium. When we add a second metal, such as lead, zinc, aluminum, we form a bi-metallic soap. This I consider one of the corners of my formula.

xQ. 132. But do you not recognize that the sodium soap may be decomposed by lead salt to form a lead soap?

A. I could not attempt to answer that.

xQ. 133. In your letter to Mr. Melzer of Sept. 19, 1894, you said: "Our mixture is in fact a saponified Stearate of Lead with the addition of a little Ozokerite or Ceresin (which is refined Ozokerite)." That view was expressed by you at the time when the composition was actually made. Do you now regard it as incorrect?

A. No, that introduces the two metals, it cannot be saponified unless it has caustic soda added to it, that is the way I look at it. There is no need of caustic soda in uniting the lead to the stearic acid. As a matter of fact, I usually added the lead to the stearic acid first, then saponified the mixture and of course introduced the second metal, sodium.

xQ. 134. The production of a soap necessarily presupposes saponification, does it not?

A. I should so consider it, though I believe there are compounds known as soap which are not saponified by caustic soda.

xQ. 135. Is stearate of lead a soap?

A. I should not so consider it.

xQ. 136. What would you call it? *A*. Stearate of lead.

xQ. 137. Is stearate of soda a soap?

A. I consider stearate of soda to be a compound made by uniting stearic acid to either sal-soda or caustic soda. This I think would be called a soap in the general acceptation of the term.

xQ. 138. Is it your idea of a soap, a chemical compound made by the action of a fatty acid or fat upon caustic soda or potash?

A. I am not a soap chemist, nor a chemist in any sense of the word, and am therefore not competent to define a technical term. My only reason for using the word "soap" in connection with these experiments is because the method of making the cylinder blank material, is similar to that used by the commercial soap makers. Whether the material really constitutes a soap or not, is a subject that I have not considered of any interest. I used the ingredients as indicated and produced the commercial results that I wished to obtain.

xQ. 139. Are you aware of the fact that lead plaster is chemically known as a lead soap. *A*. I am.

xQ. 140. Are you aware of the fact that lead plaster chemically considered, is oleate of lead?

A. I believe it is so designated in the chemistry which I have used.

xQ. 141. If oleate of lead is a soap, do you entertain any doubt that stearate of lead is not also a soap?

> Question objected to as immaterial, and defendant's counsel is asked if he intends to repudiate the testimony regarding these compositions given by defendant's witness, Professor Stillman.

A. Oleate of lead would indicate a combination or compositions of oleic acid. Stearate of lead would indicate a combination of stearic acid. I have seen oleate of lead called lead soap; I have not seen stearate of lead called a lead soap, though of course analogy might indicate that it is. Though if this were true every "ate" compound of metal throughout the entire series would also be a metallic soap.

xQ. 142. That is to say, that from your point of view phosphate of soda would be a metallic soap?

A. In my dim recollection of chemistry an "ate" compound was made by the union of an "ic" acid with a metallic base, and was known in some cases as a soap; whether it is in all cases or not, I don't know.

xQ. 143. You recognize stearic acid and oleic acid as chemically allied fatty acids, do you not?

> Objected to as indefinite.

A. My recollection is the books state that they are both found in the same organic compounds.

xQ. 144. One of the "four corners" of your composition is a hydrocarbon wax. Did you always regard this as essential?

A. I have.

xQ. 145. The use of a hydrocarbon wax you have always looked upon as one of the necessary corner-stones of your composition?

A. I have always so regarded it. I do not mean by this that it enters chemically into the combination, but that it is necessary in order to produce the commercial article which we are seeking.

xQ. 146. In your letter to Mr. Melzer of Oct. 31, 1894, you said: "We are beginning to doubt the wisdom of putting in Ozokerite. We think it will be as well to experiment without it, as it seems to introduce as bad elements as it cures, to say the least." What "bad elements" did you refer to? *A.* Well, that is some time ago, I was attempting of course, in these letters to guide Mr. Melzer in his work all that I could. This letter was a suggestion that we try a line of experiments in which Ozokerite would not be used. From the first paragraph of that letter in which I state that the samples he submitted were too gummy, I infer that my thought was that the Ozokerite was the cause of this gumminess or stickiness, and that we start out a campaign of experiments by leaving out the Ozokerite.

xQ. 147. In answer to Question 8 you stated that you consulted with a chemist in Hartford. Do you recall his name?

A. His name was Church, I have forgotten the first part of it.

xQ. 148. In answer to Question 14 you state that you gave Mr. Melzer the formula you were using. This, as I understand it, was the acetate of lead formula contained in your letters to Mr. Melzer of Sept. 11th, 1894, and Sept. 19th, 1894?

A. That is correct. There were other formulas and suggestions sent to Mr. Melzer at later dates than this.

xQ. 149. You mean the formulas suggested in the other letters from you to Mr. Melzer which appear in the record?

A. They do not all appear on the record of Mr. Melzer's testimony, many of them were given to him personally while I was in Evansville, and also while Mr. Melzer was in the factory on his two visits to Bridgeport.

xQ. 150. Can you produce a certain little red book sent you by Mr. Melzer from Evansville about Dec. 31, 1894?

A. I cannot. This book, together with one of my own in which I kept all my records, especially the notes that I made in Evansville while working there with Mr. Melzer, disappeared. Where they went I do not know.

xQ. 151. You received this book, however, from Mr. Melzer, did you not? *A.* I did.

xQ. 152. And when did you last see it?

A. They disappeared in 1895 or 1896, I think.

xQ. 153. It was in this book that Mr. Melzer suggested to you the use of hydrate of aluminum, was it not? *A*. It was.

xQ. 154. Are you not mistaken, then, in saying that Mr. Melzer suggested the substitution of oxide of aluminum for oxide of lead. You meant to say acetate of lead, did you not?

A. No, I sent Mr. Melzer both the oxide of lead formula and the acetate of lead formula. Possibly the answer might be incomplete in that I should have stated that Mr. Melzer suggested the substitution of the oxide of alumina for oxide of lead and for acetate of lead. I did not regard the difference between the oxide of lead and the acetate of lead as very material.

xQ. 155. Did you regard Mr. Melzer as in your employ, or was he employed by the Company?

A. When I first began with Mr. Melzer, it was my understanding that whatever expense was incurred should be borne by me personally. At that time I had an agreement by which I was to receive a certain amount for each blank furnished the Columbia Phonograph Company. During the time of the work with Mr. Melzer, however, this was changed, and the matter became a Company matter. I paid Mr. English personally for the work that he did, and also other expenses; but the machines which were given to Mr. Melzer, three of them, I think, were given by the Company.

xQ. 156. When am I to understand, that is to say, at what time of Mr. Melzer's employment, did his employment become a Company matter?

This line of examination is objected to as immaterial.

A. It was, as nearly as I remember, some time in October or November, of 1894.

xQ. 157. Can you produce the contract, or copy thereof, that you had with the Company?

Objected to as irrelevant and immaterial and as a privileged matter.

A. I have not the contract, it was in the form of a letter from Mr. Easton, the President of the Company. I presume he has a copy of this letter.

xQ. 158. Can you give me the general substance of Mr. Easton's letter?

A. The letter or contract to which I refer was of date some time before this; and its substance was that I was to be paid one cent for each blank made by the Graphophone Company under my formula, and used or sold by the Columbia Phonograph Company.

xQ. 159. Did the contract provide that the blanks furnished should be of any special character?

A. I think it provided that they should be satisfactory, that is all.

xQ. 160. And as I understand it, the blanks furnished by you under this contract were not satisfactory?

A. Some of them were. I was paid various sums, and also a number of rebates on account of returned blanks. So far as I can recollect this did not amount to a very large sum.

xQ. 161. How long did you work under this contract?

A. Until as stated, some time in October or November of 1894. It might have been December, I would not be sure. It was in the Fall of 1894, about the time that Mr. Melzer sent on the batches of cylinders which seemed to be satisfactory.

xQ. 162. Did you agree with the Company that you would furnish satisfactory compositions?

> The last objection is understood to be repeated to this entire line of cross-examination without being expressly recited each time.

A. The contract, if such it be called, was in the form of a letter from Mr. Easton confirming verbal arrangements and conversations which we had had from time to time, and as near as I can recollect the substance was that I was to be paid one cent per record for each blank furnished by the American Graphophone Company to the Columbia Phonograph Company, and if I recollect rightly, a paragraph stated that the blanks were to be satisfactory to the Columbia Phonograph Company.

xQ. 163. The reason why I ask if you had agreed to furnish a satisfactory composition was because of the following statement in your letter to Mr. Melzer of Dec. 22, 1894. "The sweating did not develop for some time, not until a large number had been made and sold. As soon as it did the cylinders began to come back. Of course this stopped further work on my contract. I was then in a position where I must at once furnish good cylinder material or pay for the damage. When I telegraphed you I had just been formally notified under the terms of the contract that I would be obliged to furnish a suitable wax by January 1st next or have the contract cancelled and pay the damage resulting from the loss of music and other records placed on the soft cylinder. The loss has already been considerable, and may be more." Do these statements refresh your recollection as to what you had agreed to do under this contract?

A. What I have just testified to, in my judgment fully covers the situation shown in this letter. I was told by Mr. Easton that the blanks were not satisfactory; and as his letter to me specifically stated that they should be satisfactory, I inferred then, and I would infer now, that I was not fulfilling the contract, and of course could raise no objection to the position which he took that I would not be paid for blanks which they could not use. Further, it was owing to the conversation and the situation which arose over this matter about this time which led to the withdrawal of the letter of Mr. Easton to which I have referred, and of my turning over to the Company everything that I had in the way of formulas, etc., and that thereafter everything was a regular Company matter, and my compensation was placed upon a different basis.

xQ. 164. Then as I understand the situation, while you were not obligated to furnish a satisfactory composition by January 1, 1895, if you did not furnish such composition the Company would have to look to someone else or continue to use Edison blanks exclusively?

A. I do not feel competent at this distance of time to testify as to the ideas or intentions of the Company or its execuive officers. I can only give my recollection of the facts as they occurred.

xQ. 165. In answer to *xQ.* 160 you state that the rebates on account of the returned blanks "did not amount to a very large sum," while in your letter to Mr. Melzer of Dec. 22, 1894, you state that "the loss has already been considerable and may be more." Am I to understand that the amount seemed larger to you then on account of the relatively small business done by the Company?

A. Well, this seems to be a question of deciding on the difference between a "considerable loss" and one that "did not amount to a very large sum." As the letter was written some thirteen years ago when talking machine times were not as prosperous as they are now, I think it is probable that I regarded the loss at that time as of more consequence than now.

xQ. 166. In answer to *Q.* 21 you state that "oxide of lead forms a compound that is hygroscopic." What is this compound?

A. I don't know its chemical name. I do know that such compounds did have an affinity for moisture, and that in all our moisture tests they showed up this surface film.

xQ. 167. Are you sure that it was the lead compound that made the compound hygroscopic and produce sweating or molding?

A. I believed it to be the lead, as in every case where the compound in which the lead was used was submitted to a hot, moist atmosphere (by *hot* I mean from 80 to 90 degrees), it would be affected and the surface would be covered with the film which I have described.

xQ. 168. Well did you not encounter the same difficulty when you used acetate of aluminum?

A. I did. But was informed, by Mr. Melzer, I think, that the difficulty in this case was due to a sub-acetate of sodium which was formed in the mixture when acetate of aluminum or acetate of lead was used. The clouding, though, in both cases was not so marked as when I used the oxide of lead.

xQ. 169. Did it ever occur to you that when you used oxide of lead the cloudy appearance was caused by the formation of carbonate of soda?

A. I don't recollect that that particular thought occurred to me.

xQ. 169½. From your point of view it is not only necessary that aluminum should be used, but that it should be employed in some form unlike the acetate thereof, as will not result in molding?

A. From my point of view it is essential that whatever metal we used must be such that will not produce the film or molding. If lead could be used to accomplish this, then it would be entirely satisfactory. The molding I consider a slight fault as far as the practical making of the record was concerned, and if the records could have been kept always in cool, dry places, I think there would have been no trouble with them.

xQ. 170. You state that the oxide of lead forms a hygroscopic compound which attracts moisture and results in a "cloudy or sweaty appearance." Is this what you have elsewhere referred to as oxidization? *A*. It is.

xQ. 171. In answer to Question 22 you state that you informed Mr. Melzer "that the difficulty was the sweating caused by the oxide of lead." When did you inform Mr. Melzer of this fact?

A. It must have been when I wrote him my letter of September 14, 1894, in which I say: "We ship you to-day by Adams Express a box containing samples of all the mixtures we have used. Also samples of the raw materials. With each sample I have attached a memorandum stating how the mixture was made." In that same letter I called his attention to the fact that the mixture must not mold, effloresce or change character in any way. I am very certain that in that batch of materials which I sent him I gave him full memorandum of all the difficulties that we experienced, and also (for what it was worth) my opinion of what caused the trouble and the particular thing which I wished him to cure.

xQ. 172. Mr. Melzer in his letter to you of November 21, 1894, attributes the efflorescence in your composition "to a secondary salt (acetate of soda)." He nowhere refers to any other cause for efflorescence in your composition. Is it still your recollection that you sent to Mr. Melzer samples made from lead oxide in which efflorescence was present?

The first part of the foregoing is objected to as a statement and not a question.

A. I am certain that I did send Mr. Melzer samples of a composition made from the lead oxide, and which did show this molding or efflorescence. As a matter of fact, according to Mr. Melzer's testimony, his first compositions were made with lead oxide. The first formula which he gives in answer to *Q*. 15, also the first two formulas which he gives in answer to *Q*. 15 show lead oxide.

xQ. 173. Concerning these samples using lead oxide to which you refer, Mr. Melzer in his letter of Nov. 21, 1894, states that: "We used a different form of lead" and that "they contained lead, which is prone to oxidize, and hence there is just the shadow of liability to effloresce." I understand that your experience was different from Mr. Melzer's in that you obtained more efflorescence with the lead oxide than with the lead acetate?

A. I found more efflorescence with the use of the oxide of lead than with the acetate of lead. For that reason I changed from the oxide to the acetate.

xQ. 174. In answer to Question 23 you state that you had used alum in connection with sal-soda. What are the reactions between carbonate of soda and alum?

Objected to as immaterial and as improper cross-examination.

A. As I understand the matter, when alum would be used in such a composition, hydrate of alumina or oxide of aluminum would be produced. I could not give the exact chemical reaction.

xQ. 175. What is alum?

A. I think it is the sulphate of aluminum. I shall have to look at the record before I can say any more than "I think" so.

xQ. 176. In answer to Question 27 you state that you were "using the acetate of lead to obtain the metal lead of the composition." You do not, of course, mean to say that the lead in metallic form existed in the composition, do you? *A.* No.

xQ. 177. What was the formula that Mr. English disclosed to you?

A. I don't recollect the formula exactly, it was practically what I had been using, made in the same manner, with the exception that he used acetate of alumina instead of acetate of lead.

xQ. 178. Your answer to Question 32 is not exactly clear to me. What fraud did you believe that Mr. English was guilty of?

A. Mr. English knew perfectly well our difficulty. In his various visits to the Factory and conversations in New York he knew what we were seeking to eradicate, as we talked it over quite freely. I refer now to the molding or efflorescence. He stated that he knew this, and was perfectly familiar with it, and that the material which he had developed would not have this fault, as it had been tested very carefully by him, and that it was all right. After I attempted to use it I found that the fault was just as prominent as it was in my own, and he admitted afterwards that this material was made up by him and sold to me without any test whatever.

xQ. 179. Did Mr. English represent to you that he was selling the Edison formula?

A. No. As I recollect, his conversation on that matter was that he did not know the Edison formula; that this material which he had made up was his own ideas, and that what he had made was something that he had submitted to a man named Wurth, who he said was in the Phonograph employ when he was there. I do not think that he claimed at any time that he knew the Edison formula. At least not before the time he sold it. I think he did make the claim after he had sold it to me, and after I had written him a rather vigorous letter, that he knew the formula was all right, because he had bought these particular materials for the Phonograph Company, and that he believed they were used for cylinder-making. This is a rather vague account of what happened, but is about the best recollection I have of what took place.

xQ. 180. Is this what you mean by the statement that Mr. English was a man "who had attempted to sell out his former friends" in answer to Question 32?

A. It is. My opinion of that matter is that he first tried to sell me something which he wished me to believe was entirely his own idea, and that when I found that it was a failure and accused him of telling me something that was of no value, that he attempted to bolster up his position by admitting that he was selling out something that came to his knowledge through the fact that he was the purchasing agent of the Edison Laboratory at some prior time.

xQ. 181. During your early experiments what tests did you make of the Edison composition?

A. The principle thing to which I referred in testing it was the molding, also tested the hardness, and especially for efflorescence or molding under heat and moisture.

xQ. 182. Did you ever observe the melting-point of the Edison composition? *A.* I don't recollect that I ever did.

xQ. 183. How did you obtain the formula that Mr. Storms made?

> Question objected to as without basis in the direct examination.

A. He gave it to me after he had been here several months—something over a year. He was intoxicated most of the time during the last year, so much so that it was absolutely necessary that someone else should make the mixture as he was not here to do it. Therefore I told him that it would be necessary for him to give us the formula or we should have to abandon it and him, both of which things we did after a very short time.

xQ. 184. You knew, did you not, that Storms used metallic aluminum in his formula when he first came? *A.* I did.

xQ. 185. Did Storms tell you that his was the Edison formula?

A. He did.

xQ. 186. When did he tell you this?

A. That I don't recollect some time while he was here. He admitted, however, in the conversation that he never actually made the composition in the Phonograph Works, and that he had obtained it in some round-about way, I think by asking some one to get the formula for him from the people who actually made the mixture.

xQ. 187. How long was Storms employed by the Company?

A. To my best recollection about a year, it may have been a little longer than that.

xQ. 188. Are you able to state how long it was after Mr. Storms entered your employ that he disclosed this formula to you and stated that it was the Edison formula?

A. Well, he did not disclose the formula until just before he left, which, as the record shows was some time in 1898, and as he had been here about two years, it must have been about a year and a half after he came.

xQ. 189. In your letter to Mr. Melzer of Sept. 3, 1896, you say: "I recently learned an interesting thing in connection with the Phono cylinder. A party who pretends to know states that it is made of stearic acid, caustic soda, sal-soda, 'aluminum bronze powder' and water. The alleged process is to dissolve the 'al bronze' in a solution of caustic and sal-soda, and then unite this with the stearic acid as we do. They use white Ozokerite for softening the mixture. I have found that 'aluminum bronze powder' is pure aluminum ground to an almost impalpable powder." Who was the party from whom you obtained this information?

A. This was undoubtedly from Storms. I knew what he was using when he first began, of course, because we purchased the materials for it, but the proportion of the ingredients and the method of uniting them were not disclosed.

xQ. 190. How were you advised as to the alleged "process"?

A. The man was working here—doing his work in our cylinder room, I didn't need any advice, I saw him do it, but I did not know the proportions used as stated in this letter.

xQ. 191. Did you make any attempt to obtain the proportions of materials used by Mr. Storms? *A*. Not at this time.

xQ. 192. When did you attempt to get these proportions?

A. I do not recollect. I was carrying on a very large number of experiments all the time, using various materials and if I recollect correctly, Mr. Melzer told me some time in 1896 that if I wished to use scrap aluminum, gallons of water, sal-soda and things like that, that I could do so, and he sent me some sort of directions with a suggestion that that was probably what was being used. Whether I worked it out at this time or not I am not certain.

xQ. 193. You recall do you not, that Mr. Fargo left shortly after Mr. Storms came? *A*. I do, quite distinctly.

xQ. 194. Did you know that Mr. Fargo was attempting surreptitiously to determine the proportions of ingredients used by Storms? *A*. I did not know it.

xQ. 195. In your letter to Mr. Melzer of Sept. 21, 1896, you give a formula as nearly as you could guess from seeing Mr. Storms make it. How close an observation did you make?

A. I could not tell, I have even forgotten the circumstances of this letter.

Adourned to Wednesday, May 22, 1907, at 10.30 A. M. at the same place.

BRIDGEPORT, CONN., May 22, 1907.

Met pursuant to adjournment.

Present—Counsel as before.

Cross-examination of Mr. MACDONALD continued.

By Mr. DYER:

xQ. 196. Referring to the patent in suit, I call your attention to the statement on page 1 between lines 13 and 27, and ask if the properties therein set forth were not possessed by the Edison composition from the time of your first acquaintance with it?

Objected to as not proper cross-examination.

A. It was true, in a measure, of the phonograph composition in use at that time, also in the other recording compositions. This description I take to be that of the perfect blank, or the point which any experimenter in this line would seek to attain.

xQ. 197. This description would be just as applicable to the Edison composition of 1891 or 1892, as to the Edison composition of to-day, or your own composition of to-day, would it not?

A. I think not. In my judgment the Edison composition of to-day is much superior to that of 1891 and 1892. I mean now as regards the description quoted.

xQ. 198. In what respect do you regard the Edison blank of to-day superior to the Edison blank of 1891?

Objected to as immaterial.

A. There is, as I take it, but one test to which these blanks can be subjected, and that is the result obtained from them commercially. I think the results obtained to-day are better than the results obtained in 1891 and 1892.

xQ. 199. You recognize, of course, that the conditions as regards methods of recording have improved since 1891, do you not?

A. I have understood that the Edison records are recorded now by a different type of recorder than used in 1891 and 1892. This I do not know of my own knowledge, only hearsay. But it is certain that the results are better to-day than they were then. I assume, and I think I am right, that the blank composition used to-day plays a very considerable part in obtaining this better result.

xQ. 200. I direct your attention to the statement beginning on line 46 of page 1, and ending line 57 on page 1, and ask if this statement, or these statements, were not based on your own experimental work particularly with oxide acetate of lead?

Objected to as immaterial.

A. They were so based in the greater part, though this same difficulty was noted by Bell and Tainter in their earlier experiments with carnauba wax mixtures. It is to a certain extent true of all compositions even of to-day. It was true of the Edison composition furnished in 1889, in a very marked degree.

xQ. 201. Who was it who prepared these papers for the patent in suit?

A. The patent firm of Pollok & Mauro, of Washington, D. C., I do not know which member of the firm actually did the work.

xQ. 202. Was the application for the patent in suit prepared as the result of oral explanations by you, or of written?

A. It was prepared as the result of both oral and written descriptions of my processes.

xQ. 203. I direct your attention to the statement in the patent commencing line 17 on page 2 which reads—

> "In this soap I have incorporated aluminum, which I have found to be the metal best suited in all respects for the purpose."

In what way did you find this to be true?

A. By commercially testing the blanks which were made with aluminium in comparison with those made with other metals.

xQ. 204. You do not claim, then, to have been the discoverer of the availability of aluminium as an ingredient in these compositions?

Objected to as immaterial.

A. Speaking in the light of this patent I do so claim it.

xQ. 206. Please explain this answer?

A. My understanding is that an inventor is entitled to the assistance of his employees. I gave the problems together with the basis for the formula, to my assistants. I claim the right to the use of whatever they have made under my immediate direction and supervision. I take it that the use of aluminum in the various ways indicated here was so made, as directed by me, through my legitimate employees and assistants in perfecting this formula up to the point that it appears in this patent application.

xQ. 207. As I understand your position then, when Mr. Melzer as the result of his experiments determined that aluminum was the proper metal to use and disclosed the same to you in a little red book, you regard yourself in the eye of the patent law, as the discoverer of that thing, is that correct?

Objected to as calling for a conclusion of law.

A. That is correct.

xQ. 208. And the purpose of your patent application, as I understand it, was to claim for you all compositions in which aluminum was used in connection with a partially saponified stearic acid soap?

> Objected to on the ground that the "purpose" of filing an application is immaterial, and the *effect* of the patent is a matter of law and not of evidence.

A. I am not sufficiently a patent expert to answer that question broadly, but it was my intention through this patent to cover as far as it was possible to do, the results of about five years' work in obtaining a recording composition for talking-machine sound-records.

xQ. 209. And as I understand it, one of the important, if not the most important feature that you sought to cover was the use of aluminum in these compositions?

> Objected to on the same ground, the witness' intentions, in seeking to cover anything, are not material, and are not the subject of evidence. The only material thing is the legal effect of the instrument as gathered from the application as filed and its course in the Patent Office. The only competent evidence on these points is found in the file-wrapper and contents.

A. I sought to cover the combination, or combinations, as set forth in the formulas recited in this patent. It was undoubtedly my intention to cover each and every one of them as completely as I could, as I regarded the finished product from these combinations as important.

xQ. 210. In view of your last answer, can you tell me why the product claimed in your patent has been withdrawn from the suit during the taking of your testimony?

> Objected to as incompetent because it is not shown that the witness has any knowledge on the subject, and on the further ground that the matter inquired of does not call for evidence.

A. Your questions sought to obtain my idea of what I attempted to cover in a patent application eleven years ago. My answer was confined to that question. As far as the present question is concerned, I do not know why that claim was withdrawn.

xQ. 211. At the time the application for the patent was filed, did you not know, or have strong reason to suspect, that the Edison composition was made of the formula referred to in your patent as Formula B, or that the Edison composition contained the ingredients of Formula B in substantially the proportions of the patent

Objected to as immaterial on the ground that the existence of a supposed composition at the time an application is filed is not a bar to the grant of a patent to invention by the one filing the application.

A. I had many suspicions in those days, but it is a good many years ago, and I cannot recall them all. I know that I had been informed by the former Purchasing Agent of the Edison Phonograph Laboratory that their composition was made according to a certain formula. I then had suspicions that it was made according to still another formula which was quite different, though none of these parties claimed that they actually knew how this Edison composition was made. In fact I do recollect that Mr. English, the Purchasing Agent referred to, told me that many articles were deliberately bought and never used, for the purpose of maintaining the secrecy of the work. This struck me as a very good idea at that time.

xQ. 212. Mr. English informed you as early as 1893 that the Edison composition made use of acetate of aluminium, did he not?

A. No, he did not. It was not until January, I think, of 1895 that Mr. English told me that he had purchased very large quantities of acetate of aluminum for the Edison Company, and that he believed that it was used in the cylinder composition. He did not claim that he positively knew what was used other than that he had purchased these articles for this particular department and presumed, of course, that they were used in making the cylinder material.

xQ. 213. You were informed, were you not, as early as September 3, 1896, that the Edison composition was composed of the ingredients given in Formula B of the patent?

The objection to *xQ.* 211 is repeated.

A. I was informed somewhere about this time by Storms that this was the material he wanted me to buy for him. I do not recollect that he informed me that that was what was used by the Edison people. As a matter of fact I did not question Mr. Storms very much about his formula, nor pay very much attention to his work. To a certain extent it was done here under protest.

xQ. 214. For the purpose of refreshing your recollection I direct your attention to the following statements: In your letter to Mr. Melzer of Sept. 3, 1896, you said "I recently learned an interesting thing in connection with the Phono cylinders. A party who pretends to know states that it is made of Stearic

Acid, Caustic Soda, Sal Soda, 'Aluminum Bronze Powder' and water. The alleged process is to dissolve the 'Al Bronze' in a solution of caustic and sal soda, and then unite this with the Stearic Acid, as we do." In your letter to Mr. Melzer of Sept. 21, 1896, you say: "Now in regard to the formula I mentioned as coming from the E people. I am afraid you will have to modify your good opinion of Thomas as there is little doubt that their formula is practically what I told you." In your letter to Mr. Melzer of Oct. 6, 1896, you said: "They have so made them at Edison's place, and if your idol stood on a more scientific basis than this, to earth he must come at last." In your letter of Oct. 17, 1896, to Mr. Melzer you said: "The young man of whom I spoke in my former letter assures me that every cylinder made at the Edison Works during the last four years have been made with Al Bronze Powder." Bearing in mind that the application for the patent in suit was filed on Nov. 27, 1896, did you not know at that time, or have very strong reason to suspect, that the Edison cylinder or composition had for several years been formed of the composition set forth in Formula B of the patent in suit?

Objected to as immaterial for the reasons noted after *xQ*. 211, further objected to as incompetent because the stating part of the question does not put before the witness the letters from Mr. Melzer which form a part of the correspondence from which the quoted extracts were taken.

Counsel for defendant calls attention to the fact that the letters from which the quotations have been made, are those written by the witness himself, and the purpose of such quotations is solely to refresh the recollection of the witness as to his attitude of mind immediately preceding the filing of the application.

Complainant's counsel now adds the further objection that the question is incompetent because it seeks to inquire as to the mental attitude of a party to a written document which is, of course, incompetent.

A. These quotations are excerpts only from letters written by me some eleven years ago. The correspondence which brought about these letters not being before me, nor the entire letter which I had written at that time, I can add nothing to my previous answer upon this point further than to state that whatever I may have given in the way of a formula regarding the party in question mentioned in these letters, was my own proposition as to what was used. There was another letter which is not here in which I made the statement to Mr. Melzer that I did not wish to use the blanks but that I preferred decidedly the formula under which I was then working.

xQ. 215. You do not deny, do you, that Formula B of the patent is substantially the formula that Storms was using in September, 1896?

A. Formula B of my patent was worked out by myself. The assistance that I obtained from Storms in this respect I conceive to be the assistance of an employee. He did not give me any proportions, and I did not know at the time even that this was his formula. As a matter of fact the proportions cited in this letter of Sept. 21st was not the formula as Storms used it. It was a guess, and was only approximately correct.

xQ. 216. You did know, however, in September, 1896, that Storms was using the several ingredients of Formula B of the patent? *A.* I did.

xQ. 217. And you had strong reasons to suspect, if you did not know positively, that those were the ingredients of the Edison composition?

The objections already entered are repeated to this entire line of cross-examination.

A. I had just as strong reasons to suspect that they were not, as I had been informed as fully by as reliable a source, if not more so, than Storms, within fifteen months, that the Edison Phonograph formula was radically different. As neither of the parties giving the information claimed absolute knowledge, my suspicions were evidently mixed. As a matter of fact I have never believed and do not now believe that either English or Storms ever knew the exact Edison formula.

xQ. 218. Did Storms impress you as a man who would be likely to produce a successful formula himself?

A. I could not answer as to my impressions of Storms at the time he came here. At the time he left, which, of course, is subsequent to the application for the patent, my impressions were that at that time he could not produce much of anything. What he might have done years ago, however, I am not in a position to say. My exact belief in regard to Storms was that whatever his formla was, it was something that he had picked up or made up himself from his work as a mixer in the Edison Works.

xQ. 219. When you first entered into correspondence with Mr. Melzer, did you not send him a sample of the Edison composition with the request to analyze it if possible?

A. I do not recollect that I ever made a request of Mr. Melzer for analysis.

xQ. 220. In your letter to Mr. Melzer of March 14, 1895, you state: "You may be sure that we will be more than interested in the result of Charles' analysis. I am curious to know how close two people, hundreds of miles apart, can come with no possible communication between them, and will await the result with eagerness." Are you not there referring to an analysis of the Edison composition?

A. Have you the letter of Mr. Melzer which brought this out? I could not answer unless that letter were presented. My impression is that this is a voluntary contribution on Mr. Melzer's part. As to whether it referred to the Edison blank or some other blank or some other matter I could not say now.

xQ. 221. I refer you to Mr. Melzer's letter of March 31, 1895, where an analysis of a composition is given followed by a reference to "the Silver Lake People." Refreshing your recollection from this letter, please state whether Mr. Melzer did not, at your request, or on his own initiative, make an analysis of the Edison composition and report to you?

A. I did not request Mr. Melzer to make any analysis. The letter in which this analysis appeared was written at Mr. Melzer's own initiative, and the original suggestion to make the analysis was at Mr. Melzer's initiative.

xQ. 222. Do you recall having received this analysis from Mr. Melzer?

A. The only recollection I have of this matter is that I had a copy in a book to which I have referred as having been lost, which, I think, is the same or very similar to that given in Mr. Melzer's testimony in *Q.* 96. Whether this was given me directly by Mr. Melzer and copied by me, or taken from a letter, I do not know at this time.

xQ. 223. Do you recall examining this analysis and expressing the hope that Mr. Melzer might be able to duplicate it?

A. I do not recall what occurred in connection with it.

xQ. 224. With reference to Formula A of the patent in suit, that is precisely the formula that Mr. Melzer disclosed to you, is it not, except that the amounts suggested by Mr. Melzer were in each case one-eighth of those given in the patent?

A. That I do not recall. The formula under A in the patent was the exact formula that we were using for making up the batch of records at the time the patent was first applied for, or at least the first consultation I had with the patent attorneys which was some time in July, I think, 1896. Whether it was exactly like Mr. Melzer's formula as shown in the little red book, I cannot now recall.

xQ. 225. Did not the formula contained in your letter of Sept. 11, 1894, to Mr. Melzer, represent high-water mark, so to speak, of your efforts up to that time to produce a successful composition for sound-records?

A. We were making several mixtures at this time, and I take it that the paragraph in this letter means that I usually made the mixture herein quoted. That is what I said at the time, that I "usually" make it in the manner here given. But in the previous letter to Mr. Gathman on this same subject, and about this same time, I note that I said "Add about ten per cent. of acetate of lead or common litharge." I would infer from this that at about this time I was not quite sure whether the acetate of lead or the oxide of lead, that is litharge, was the better.

xQ. 226. It is a fact, though, is it not, that up to September 11, 1894, your best results in this line had been obtained by the use of oxide of lead or acetate of lead? *A*. They had been.

xQ. 227. On page 1, lines 57-63 of your patent occurs the following: "I have found that lead in any form as well as most of the salts of other metals which might be otherwise suitable for the purpose in view give rise to hygroscopic compounds. This is particularly true of stearate and acetate of lead." Did not the composition as developed by you, up to Sept. 11, 1894, contain these objectionable leads, stearate or acetate? *A*. They did.

xQ. 228. The formula put by you into Mr. Melzer's hands at the outset, therefore, was the formula upon which according to the patent in suit, it was the object of the patented invention to improve, was it not?

> Question objected to as incompetent because it calls on the witness not only to construe the patent, but also to state the "object" of the patent.

A. The formula put into Mr. Melzer's hands as far as a sound-recording tablet goes, was just as good and in my judgment now possibly a little better than that which was finally developed and shown in this patent. Its sole fault was that after a period of time a cloudiness appeared on the surface of the records which injured them commercially. This injury did not take place if the records were used within a reasonably short time, as many thousands of them were so used. Mr. Melzer was not instructed to change the formula or to make a new formula. He was employed by me as an assistant, with my help and assistance given him in every way, to obliterate this difficulty if possible. His assistance resulted in the suggestion that I should substitute still a third metal, a form of aluminum, for the lead which I had been using. This did not improve the blank in any way for the purpose intended. It acted, if I may use the expression, as a preservative, so that it might be used at a later period than those that I had given him.

Adjourned to 2 P. M.

RE-DIRECT EXAMINATION, by Mr. MASSIE:

R-dQ. 229. In whose handwriting are the entries in the note book from which you quote the entry of Dec. 24, 1892, in the last part of your answer to *Q.* 3?

A. The entry referred to, Formula of Dec 24, 1892, is in my handwriting. A very large part of the book is in my handwriting, the balance is in the handwriting of Clarence Fargo. All of the entries to page 25 inclusive are in my handwriting. The formula given on the top of page 26, is in my handwriting, but the notes following on this page are in the handwriting of Clarence Fargo. The same is true of page 27. The entries after this are most in my handwriting and in that of Clarence Fargo. In many cases, as in the top of page 32, I wrote out the formula which I wished him to experiment with, and the notes following are his observations of the workings of the formula, and also slight variations of the proportions. This is true in a number of cases in the book.

R-dQ. 230. Please state your custom with regard to dating entries in this and other note books kept by you, that is, what do the dates indicate?

A. The dates indicate when the entry was made.

R-dQ. 231. And the entries relate to matters as of such dates or at least of a day or two earlier in each case? *A.* They do.

R-dQ. 232. Who had the custody of this book and where has it been in the meantime?

A. The book was in my custody ostensibly, though, of course, while Mr. Fargo was entering his notes it was actually in his possession, as were other note books used in the same manner. It has been in my possession since the dates of the last entry.

R-dQ. 233. During the period when Mr. Fargo was making entries in this note book, what knowledge did you have as to the correctness of the dates of his entries, and as to the entries made by him? That is, what knowledge did you have of Mr. Fargo's work, and what opportunities did you have from time to time of examining this note book to check up his entries therein?

A. I was in constant communication with him, many of the entries were made at my direct dictation, or at least suggestion —I had access to the book at any time I wished it, and as far as I know the dates which appear in his handwriting give the correct date on which he made the entry.

The note book in question is offered in evidence as Complainant's Exhibit, Macdonald Note Book Dec. 24, 1892, to Aug. 27, 1895.

R-dQ. 234. Since you began your testimony in this suit have you obtained any other note books kept by you or under your direction during the general period covered by your direct examination?

A. I have, a note book covering a period from March 2nd to May 1st, 1892. This was a book which I kept in our old Factory in East Bridgeport, and was not used after we moved into the present location, the last entry being made on the day on which we moved to this Factory.

Complainant's counsel states that for convenience he has numbered the first thirty pages of this book in pencil.

R-dQ. 235. In whose handwriting are the entries in this book; and what can you say as to when the various entries were made?

A. The book is entirely in my handwriting. The dates are the dates of the entries—that is, the date on which I made the note which follows each entry.

R-dQ. 236. This book has been in your possession since the last entry was made, has it? *A*. It has.

The book is offered in evidence as Complainant's Exhibit, Macdonald Note Book March 2, 1891, to May 1, 1892.

R-dQ. 237. Have you any other books relating to the same general period?

A. I have a book of notes kept by Clarence Fargo during this period. This book is entirely in Fargo's handwriting, I think. It may be that there are some entries here by Eben Dodge, but I am not entirely certain as to that.

For convenience complainant's counsel has numbered the first forty-three pages of the book in red ink.

R-dQ. 238. What opportunity did you have for examining this book while Mr. Fargo was engaged on the work reported in the book; and what observations, if any, did you make as to the correctness of the dates of his entries, and as to the entries themselves?

A. I do not recollect that I actually checked any of the formulas in this book. It was kept by Fargo, and I presume that I had access to it at the time, though I cannot recollect or recall any particular formula here which I checked. I knew of the book, however, and of the purpose of its being kept.

xQ. 239. What was the purpose of Mr. Fargo's keeping this book?

A. It contained data concerning his work upon my formula made with acetate of lead, and records of his experiments under that formula.

R-dQ. 240. It was kept, was it, as a part of his regular duties as an employe?

A. The book was issued to him by the Company. It is their property and was their property, and kept by him under my instruction. It was a part of his duties to so keep it.

R-dQ. 241. The first entry in the book is dated Sept/ 16, 1894, and the last entry Nov. 30, 1894. In whose custody has the book been since November, 1894?

A. It has been in my custody.

> The book in question is now offered in evidence as Complainant's Exhibit, Macdonald-Fargo Note Book of September-November, 1894.

R-dQ. 242. Have you any other note book of the same general period?

A. I have another note book also in Fargo's handwriting in the main, though there are a few entries in this book in my own handwriting. This book was kept by Fargo at my instance, as a record of definite experiments that were made and which were either set aside by time tests or were used in making tests upon the graphophone.

R-dQ. 243. Do you make the same answer with regard to this last note book that you did concerning the other Fargo note book as to the dates of entries therein, custody of the book etc?

A. I do.

> The book in question is offered in evidence as Complainant's Exhibit, Second Macdonald-Fargo Note Book of Oct. 29, 1894, to Nov. 30, 1894.
>
> The four note books are offered in evidence by complainant as physical exhibits, and will be available to defendant for further cross-examination, and will be produced at the hearing or at any reasonable time

when called for. Complainant reserves the right to introduce extracts to be printed in the record.

Adjourned subject to new notice.

July 12, 1907.

Met pursuant to agreement.

Present—C. A. L. MASSIE, for complainant.

Mr. Massie states that by consent of Mr. Dyer it is stipulated that Mr. Macdonald would testify as follows in answer to further re-direct examination:

R-dQ. 244. What kind of thermometers did you and your assistants employ during the period covered by the four note books above offered in evidence herein?

A. Fahrenheit thermometers, and the temperatures given in the note books aforesaid are degrees Fahrenheit.

R-dQ. 245. Please refer to your answer to *xQ*. 82 and state what you mean by "72" in that connection?

A. I mean that the caustic soda which I and my assistants were employing during that time was only about 72% pure. That is, one hundred parts of this article really contained only seventy-two parts of the chemical.

R-dQ. 246. Please explain the meaning of the symbols which I am now pointing out to you in your exhibit note books?

A. I refer you for the meaning of these and other symbols to page 2 of the flexible back book, page 30 of the same, and page 90 of the same.

St means stearic acid (or stearine);
Ct means oxide of lead;
Sl means sugar of lead;
Cs (or *Scau*) means caustic soda;
Ce means ceresin;
BO and *YO* mean black and yellow ozokerite respectively;
Pf means paraffin;
Al means acetate of aluminium;
Cp means caustic potash;
Cnr means Carnauba wax;
qs means "sufficient for the purpose."

Adjourned subject to new notice.

September 17, 1907.

Met pursuant to agreement.

Present—Counsel as before.

Further CROSS-EXAMINATION of Mr. THOMAS H. MACDONALD, by Mr. Dyer:

xQ. 247. Mr. Manwaring, who was cross-examined yesterday, testified concerning the experiments given in your several note books which have been introduced herein. In some, if not all of these note books, the abbreviations "Al" appears. Mr. Manwaring assumed that this abbreviation referred to an aluminum sale and not acetate of lead, as I understand you have testified was the case. On the assumption that "Al" represented acetate of aluminum or some other aluminum salt Mr. Manwaring has testified that a great many of your experiments relate to compositions in which an aluminum salt was used and he was not able to find in these note books a single experiment which, from his point of view, related to acetate of lead. Please say whether Mr. Manwaring in the conclusions which he has drawn from these note books on this point is correct or incorrect?

> Mr. Massie—Statements as to what defendant's counsel understands are objected to as not forming a part of the question, and of course we do not accept them as correct interpretations of the testimony already given, and they are therefore objected to.

A. With regard to Mr. Manwaring's testimony, I have not read it with sufficient care to answer this question categorically. As a matter of fact "Al" where it appears in this note book in my handwriting (witness refers to "Complainant's Exhibit Mardonald Notes, December 24, 1892 to August 27, 1895") means acetate of lead.

xQ. 248. And you have also testified, have you not, that "Al" was the abbreviation used by Mr. Fargo for acetate of lead?

A. I have.

xQ. 249. Now referring to "Complainant's Exhibit Macdonald Notes December 24, 1892, to August 27, 1895," does the alleged index on page 30 thereof appear in your handwriting? *A.* It is.

xQ. 250. When did you write this index in this book?

A. It must have been written about 1896 or 1897, possibly in 1898.

xQ. 251. It was written then several years after the entry of the various experiments in the book? *A.* It was.

xQ. 252. And the index is incorrect in the statement that "Al" represents acetate of alumina, is it not? *A.* It is.

xQ. 253. In your note book "Complainant's Exhibit Macdonald-Fargo Note Book of September-November, 1894," and which so far as I judge seems to be almost entirely in Mr. Fargo's handwriting, the abbreviation "Al" is frequently used. In these experiments this also refers to acetate of lead, does it not?

A. The "Al" in this book refers to acetate of lead.

xQ. 254. I think the two books that we have just considered are all that make use of this abbreviation, but in order to be absolutely certain I will ask if in your experiments you recall having used the abbreviation "Al" or "AL" in any other sense than as meaning acetate of lead?

A. My impression is now that this abbreviation was confined to acetate of lead, though I think in some of the books you will find an abbreviation "A. Al" which meant acetate of aluminum. This abbreviation I know I used toward the last of my experiments in 1896 and 1897, and it was unodoubtedly owing to this abbreviation that I made the error in finally writing out the explanation of symbols appearing on page 30 of the flexible note book, "Complainant's Exhibit Macdonald Note, Dec. 24, 1892, to Aug. 27, 1895."

xQ. 255. In view of the answers you have just given it is a fact then, is it not, that if you had answered *R-dQ.* 246 yourself instead of your counsel volunteering to answer it for you, you would not have said that "Al" means "acetate of aluminum?"

A. The answer is wrong in this respect.

By Mr. Massie—I think it proper to state that in formulating the stiplated questions and answers appearing on July 12, 1907, I prepared the answer to *R-dQ.* 246 after examining the note books themselves, particularly page 30, and did not have in mind the testimony concerning Mr. Fargo which has been referred to this morning.

By Mr. Dyer—Counsel for defendant of course has no idea that the interpretation of the abbreviation as it was supposed by counsel for complainant to have been intentionally wrong, and he appreciates the circumstances of the case and realizes that without Mr. Macdonald's help the error might very naturally have arisen.

Signature of the witness and certificate of the Magistrate are waived.

Under the stipulation heretofore entered into between counsel for the respective parties hereto, complainant's counsel now offers in evidence the following extracts from the rebuttal deposition given by Jonas W. Aylsworth in the companion suit now pending in this Court entitled "New Jersey Patent Co. *vs.* Columbia Phonograph Co., General," on the Aylsworth patent, to wit, *xQs.* 82 and 83 (appearing on pages 223-224 of complainant's printed rebuttal proofs in said suit); and the paragraph of Mr. Aylsworth's answer to *Q.* 245 (beginning at the bottom of page 268 and ending at the top of page 269 of complainant's said printed rebuttal proofs.

In the Circuit Court of the United States for the District of New Jersey.

AMERICAN GRAPHOPHONE COMPANY
vs.
NATIONAL PHONOGRAPH COMPANY.
In Equity, No. 10.
March Term, 1905.

September 9th, 1907.

Present—C. A. L. MASSIE, Esq., on behalf of complainant.

Mr. Massie states that by agreement with Frank L. Dyer, Esq., of counsel for defendant, the direct examination of the witness George A. Manwaring may be taken in Mr. Dyer's absence, reserving defendant's right of objection and of cross-examination at an early date.

Thereupon, GEORGE A. MANWARING, a witness produced on behalf of complainant, being duly sworn, in answer to questions by Mr. MASSIE, deposes as follows:

Q. 1. Please state your name, age, residence, and occupation?

A. G. A. Manwaring; age, thirty-eight; residence, Bayonne City, New Jersey; occupation, consulting engineer.

Q. 2. Have you read the note books made Exhibits herein; and if so, do you understand the same?

A. I have read them, and I believe I understand the same.

Q. 3. Please state what experience you have had that enables you to understand, and qualifies you to explain, the entries therein?

A. I have since the age of twelve years been more or less intimately associated with chemical manufacturing, having been employed by the New York & Chicago Chemical Co. in 1883; I was Laboratory Superintendent for Armour & Co. in Chicago, during which time I had entire charge of the manufacturing of their pharmaceutical preparations. I was later employed by the Crown Chemical Co., formerly of Camden, N. J.; and still later I built, equipped and managed a chemical works at Moorestown, N. J.; besides which I have done considerable reading and investigating in various subjects connected with chemical manufacturing in special lines. I have also, for four or five years past, made more or less of a study of compositions intended for use in connection with making sound-records, both cylinder and disc, having read various patents issued in connection therewith, studied the properties and uses of waxes, gums, resins, hydrocarbons, clays, etc., etc., and experimented considerably therewith.

Q. 4. I show you Mr. Macdonald's testimony in answer to *R-dQ.* 246, where he gives the meanings of the symbols used in these Note Books. Please pick out those entries that relate to cylinder compositions—and for convenience in identifying them, will you read their respective pages and dates into the record? I refer to "Complainant's Exhibit, Macdonald Note Book, March 2, 1891, to May 1, 1892"; "Complainant's Exhibit, Macdonald Note Book Dec. 24, 1892, to Aug. 27, 1895"; and "Complainant's Exhibit, Macdonald-Fargo Note Book of September-November, 1894."

A. Referring to Note Book Exhibit marked "Complainant's Exhibit, Macdonald Note Book, March 2, 1891, to May 1, 1892," I find recorded many experiments on cylinder compositions, as follows:

On page 1, under date of March 2, 1891, two experiments; page 2, same date, one experiment; page 2, under date of March 10, 1891, one experiment; page 3, under date of March 11, a record of having made several cylinders; one experiment on March 12, 1891; another on March 17; nine experiments during the month of April, recorded on pages 5-7, inclusive; four during July; one during August; forty-eight during November; all the above were during the year 1891.

I find on page 22 of the same book, under date of Jan. 16, 1892, that experiments were again resumed in the same line, and find that during the month of January, 1892, twenty-seven batches or experiments were made. During February, same year, beginning Feb. 20, 1892, at least one, and indications that several other experiments were made. During the month of April three experiments at least were made.

Referring to "Complainant's Exhibit, Macdonald Note Book Dec. 24, 1892, to Aug. 27, 1895," I find experiments to have been made in connection with the cylinder compositions as follows: Dec. 24, 1892, page 3, one formula; same date, page 4, one formula; Dec. 28, 1892, page 5, one formula; during the month of Jan., 1893, three formulas; during February, same year, five formulas; during the month of April, same year, five formulas; during June, same year, one formula; during May, 1894, nine formulas; during June, 1894, one formula; between June 8 and June 29, two formulas; June 29 to 30, four formulas; July 5-27, inclusive, twenty-eight formulas; August 7-29, inclusive, eleven formulas; between Sept. 1 and 18, same year, thirteen formulas; Sept. 18-21, inclusive, eighteen formulas; between Sept. 21 and Nov. 3, one formula; Nov. 3, one formula; between Nov. 3, 1894, and April 11, 1895, on pages 93-99, inclusive, I find incomplete records of numerous formulæ.

In Note Book "Complainant's Exhibit, Macdonald-Fargo Note Book of September-November, 1894," I find records of experiments on cylinder compositions as follows:

In Sept. 1894, twenty-five formulas; in October, 1894, fifteen formulas.

Q. 5. In answer to *Q.* 49 and *xQ.* 81 (which I now show you) Mr. Macdonald sets forth what he regards as "the four corners" of his invention. Kindly note on the record the dates of entries in these Exhibit Note Books that show Mr. Macdonald's *"four corners"*?

A. In "Complainant's Exhibit, Macdonald Note Book March 2, 1891, to May 1, 1892," I find Mr. Macdonald's "four corners" recorded as follows:

On page 24 of said Note Book, I find under date of Feb. 20, 1892, on said page 24, a formula which complies with Mr. Macdonald's stipulated "four corners." I also find a second formula on the same date. Again on page 28, under date of April 24, 1892, I find one of Mr. Macdonald's "four corner" formulas.

Referring to "Complainant's Exhibit, Macdonald Note Book Dec. 24, 1892 to Aug. 27, 1895," I find formulas responding to the "four corner" requirements as follows:

Page	3	Dec. 24, 1892,	1	formula
"	4	Dec. 24, 1892,	1	"
"	5	Dec. 28, 1892,	1	"
"	13	Jan. 1, 1893,	1	"
"	19	Jan. 18, 1893,	1	"
"	20	Jan. 26, 1893,	1	"

Page	22	Feb. 18, 1893,	1	formula
“	27	April 18, 1893,	1	“
“	31	May 3, 1894,	1	“
“	31	May 4, 1894,	1	“
“	31	Between May 4–16, 1894,	1	“
“	32	May 16, 1894,	1	“
“	32	May 23, 1894,	1	“
“	32	May 25, 1894,	1	“
“	33	May 25, 1894,	1	“
“	33	May 25, 1894,	1	“
“	33	May 25, 1894,	1	“
“	33	May 25, 1894,	1	“
“	34	June 8, 1894,	1	“
“	36	Between June 8–29, 1894,	1	“
“	37	Between June 9–29, 1894,	1	“
“	38	June 29, 1894,	1	“
“	39	June 29, 1894,	1	“
“	39	June 29, 1894,	1	“
“	40	June 30, 1894,	1	“
“	41	July 5, 1894,	1	“
“	41	July 6, 1894,	1	“
“	41	July 7, 1894,	1	“
“	42	July 10, 1894,	1	“
“	42	July 14, 1894,	1	“
“	42	July 6, 1894,	1	“
“	43	July 6, 1894,	2	“
“	44	July 6, 1894,	1	“
“	45	July 6, 1894,	1	“
“	46	July 6, 1894,	1	“
“	46	Between July 6–12, 1894,	1	“
“	47	Between July 6–12, 1894,	2	“
“	50	July 13, 1894,	1	“
“	51	July 17, 1894,	1	“
“	52	July 17, 1894,	1	“
“	53	July 20, 1894,	1	“
“	53	July 21, 1894,	1	“
“	54	July 20, 1894,	1	“
“	54	July 21, 1894,	1	“
“	55	July 22, 1894,	1	“
“	56	Aug. 7, 1894,	1	“
“	57	Aug. 8, 1894,	1	“
“	57	Aug. 9, 1894,	1	“
“	60	Aug. 27, 1894,	2	“

Page	61	Aug. 20, 1894,	1	formula
"	62	Aug. 29, 1894,	1	"
"	63	Sept. 6, 1894,	1	"
"	68	Sept. 10, 1894,	1	"

Referring to "Complainant's Exhibit, Macdonald-Fargo Note Book of September-November, 1894," I find formulæ comprising Mr. Macdonald's "four corner" requirements as follows:

Page	3	Sept. 16, 1894,	1	Formula
"	5	Sept. 16, 1894,	1	"
"	8	Sept. 16, 1894,	1	"
"	9	Sept. 16, 1894,	1	"
"	10	Sept. 17, 1894,	1	"
"	11	Sept. 15, 1894,	1	"
"	12	Sept. 19, 1894,	1	"
"	13	Sept. 19, 1894,	1	"
"	14	Sept. 20, 1894,	1	"
"	15	Sept. 20, 1894,	1	"
"	16	Sept. 21, 1894,	1	"
"	17	Sept. 21, 1894,	1	"
"	20	Sept. 25, 1894,	1	"
"	23	Sept. 25, 1894,	1	"
"	25	Sept. 22, 1894,	1	"
"	29	Oct. 1, 1894,	1	"
"	29	Oct. 1, 1894,	1	"

Q. 6. Will you now read into the record the dates of the entries that show *incomplete saponification* in Mr. Macdonald's "four corners," giving the *percentage* of saponification in each case?

A. "Complainant's Exhibit, Macdonald Note Book Dec. 24, 1892, to Aug. 27, 1895," I find record of cylinder composition formulæ showing partial saponification as follows:

Page	27	April 18, 1893,	42½%
"	31	May 3, 1894,	63¾%
"	31	May 4, 1894,	63¾%
"	31	May 4–16, 1894,	63¾%
"	32	May 23, 1894,	63¾%
"	33	May 25, 1894,	63¾%
"	33	May 25, 1894,	95½%
"	33	May 25, 1894,	63¾%
"	33	May 25, 1894,	57%
"	34	June 8, 1894,	65%
"	36	Between June 8–29, 1894,	63¾%

Page	37	Between June 8–29, 1894,	63¾%
“	38	June 29, 1894,	42½%
“	39	June 29, 1894,	63¾%
“	39	June 29, 1894,	47¾%
“	40	June 30, 1894,	63¾%
“	41	July 5, 1894,	63¾%
“	41	July 6, 1894,	63¾%
“	41	July 7, 1894,	63¾%
“	42	July 10, 1894,	63¾%
“	42	July 14, 1894,	63¾%
“	42	July 6, 1894,	63¾%
“	44	July 6, 1894,	63¾%
“	45	July 6, 1894,	63¾%
“	46	July 6, 1894,	63¾%
“	46	Between July 6–12, 1894,	71%
“	47	Between July 6–12, 1894,	51%
“	47	Between July 6–12, 1894,	51%
“	50	July 13, 1894,	51%
“	51	July 17, 1894,	63½%
“	55	July 22, 1894,	63¾%
“	56	Aug. 7, 1894,	63¾%
“	57	Aug. 8, 1894,	63¾%
“	57	Aug. 9, 1894,	63¾%
“	68	Sept. 10, 1894,	63½%

In "Complainant's Exhibit, Macdonald-Fargo Note Book of September-November, 1894," I find formulæ showing cylinder compositions showing partial saponification as follows:

Page	3	Sept. 16, 1894,	48
“	5	Sept. 16, 1894,	48
“	8	Sept. 16, 1894,	14.3
“	9	Sept. 16, 1894,	9½
“	10.	Sept. 17, 1894,	48
“	11	Sept. 15, 16, 17, 1894,	42½
“	12	Sept. 19, 1894,	53
“	13	Sept. 19, 1894,	42½
“	14	Sept. 20, 1894,	42½
“	15	Sept. 20, 1894,	42½
“	16	Sept. 21, 1894,	42½
“	17	Sept. 21, 1894,	45
“	19	Sept. 22, 1894,	29
“	23	Sept. 25, 1894,	45
“	25	Sept. 22, 1894,	53

Page	29	Oct. 1, 1894,	53
"	29	Oct. 1, 1894,	53
"	29	Oct. 1, 1894,	53

Q. 7. From your examination of these Exhibit Note Books, what do you understand to be meant by the symbols or words—"Al," "Alum," "Al'm" and "A.Aln"?

A. I find in "Complainant's Exhibit, Macdonald Note Book Dec. 24, 1892, to Aug..27, 1895," on page 30 thereof, a statement to the effect that "Al" means or equals "acetate aluminum," and I find this symbol used throughout the notes on succeeding pages up to page 90 of the same book, where I find a note to the effect that "Alum" equals "oxide of alumina" and also that "A.Aln" equals "acetate alumina." And I find in the Note Books nothing inconsistent with these statements as to the meaning of the symbols. I also find throughout the Book mention made in several places of using "lumps," "pounding fine," "dissolving in water," etc., etc., all of which would be correct and consistent with the explanation given as to what these symbols mean on said pages 30-90.

Q. 8. Assuming these entries to be reliable, what do you understand from them Mr. Macdonald was using where he specifies "Al," "Alum," "Al'm," and "A.Al'n"?

A. Either alum (sulphate of aluminum), or oxide of aluminum, or acetate of aluminum—in other words, in every case he made use of the metal aluminum specifically in the form of salt of that metal.

Q. 9. Please read into the records some of the early entries relating to the use of Carnauba wax, giving not only the formulas but the notes or remarks that follow, and noting where the composition is a "metallic" soap"?

A. In "Complainant's Exhibit, Macdonald Note Book, March 2, 1891, to May 1, 1892," I find on page 1 that Carnauba wax is mentioned as having been used in a formula for cylinder material, with the comment that "Carnauba seems to make it harder and a better recording surface but shrinks much more and will not stay on paper too well." This reference to the use of Carnauba wax was in connection with what Mr. Macdonald calls his "Chocolate Mixture," composed of 5 lbs. Black Ozokerite, and 5 lbs. Paraffine.

I find on page 11 of the same Book, three formulas wherein Carnauba wax is used as follows:

No. 1.	Paraffine,	40 parts
	Ozokerite,	55 parts
	Carnauba wax,	5 parts
No. 2.	Paraffine,	44 parts
	Ozokerite,	50 parts
	Carnauba wax,	6 parts
No. 3.	Paraffine,	50 parts
	Ozokerite,	45 parts
	Carnauba wax,	5 parts

Again I find on page 12 of the same book, reference to the addition of carnauba wax to a composition composed of equal parts of Ozokerite and Parafine and the statement following that "the addition of Carnauba makes a little harder and a little better recording surface."

On page 28, same book of notes, dated April 24, 1892, I find the formula containing Carnauba wax, as follows:

Litharge (Oxide of Lead),	5 parts
Stearic Acid,	16 parts
Ceresin,	8 parts
Caustic Soda,	10 parts
Carnauba wax,	3 parts

With these proportions the Stearic Acid would be saponified to produce a "metallic soap" so-called.

I find on page 29, in reference to the preceding formula, that Mr. Macdonald says "great shrink in cooling due to Carnauba probably."

I find in "Complainant's Exhibit, Macdonald Note Book Dec. 24, 1892, to Aug. 27, 1895," on page 4 thereof, a formula under date of Dec. 24, 1892, marked "Mixture No. 2" containing Carnauba wax as follows:

Lead Oxide,	5 parts
Stearic Acid,	16 parts
Ceresin,	8 parts
Caustic Soda,	10 parts
Carnauba wax,	6 parts

Immediately following said formula Mr. Macdonald makes comment as follows in comparing formula to a preceding one identi-

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cally the same with the exception that Carnauba wax had not been used: "The second mixture is much darker in color; it presents a much better appearance. The odor of Carnauba wax is prominent. On smooth cut it presents fine appearance. The fracture is good."

On page 5, same book, Mr. Macdonald takes two parts of this mixture from the tube and adds one part of Carnauba, and calls this new mixture Mixture No. 3, which, figured into its elements would be as follows:

Lead Oxide,	10 parts
Stearic Acid,	32 parts
Ceresin,	16 parts
Caustic Soda,	20 parts
Carnauba wax,	13 parts

After this formula, amongst other things, Mr. Macdonald said: "Shrinkage on cooling great, due to Carnauba undoubtedly." This composition also is a metallic soap.

On page 19, same book, under date of Jan. 18, 1893, I find Mr. Macdonald's Mixture No. 4, which, figured into its elements, would be as follows:

Lead Oxide,	5 parts
Stearic Acid,	16 parts
Ceresin,	8 parts
Caustic Soda,	16 parts
Carnauba wax,	16 parts

No comment is made by Mr. Macdonald as to the qualities of this mixture. There is saponification here.

On page 24 of the same book, under date of Feb. 23, 1893, I find a formula as follows:

Lead Oxide,	12 parts
Stearic Acid,	32 parts
Caustic Soda,	12 parts
Carnauba wax,	8 parts

In regard to this formula Mr. Macdonald makes no comment as to the effect of the Carnauba. There is saponification here also.

Q. 10. In Mr. Melzer's testimony (answer to *Q.* 4) is given a letter from Mr. Macdonald (written in or earlier than August, 1894) from which I extract the following:

> "I mix the stearine and ozokerite, eight of stearine and one of ozokerite, then add about ⅛ the weight of caustic soda; after this is boiled for twenty-four to thirty hours I add about 10% of acetate of lead or common litharge."

Assuming that the caustic soda is only 72% pure, what is the degree of saponification here; and please state whether or not the foregoing extract describes what Mr. Macdonald has called his "four corners"?

A. In the formula given in Mr. Melzer's letter the "four corners" of Mr. Macdonald's invention are shown and the saponification would be about 57%.

Q. 11. A page or two further on in Mr. Melzer's testimony he quotes Mr. Macdonald as stating in letter written Sept. 11, 1894 (Melzer, *Q.* 7), that he (Macdonald) took 320 lbs. of stearine, 50 lbs. Ozokerite, 40 lbs. acetate of lead, 32 lbs. caustic soda. I will ask you the same questions about this formula, viz: Does it give the "four corners," and what is the degree of saponification (assuming the caustic soda to be only 72% pure)?

A. The formula shows the "four corners," and the sponification is 50¾%.

Q. 12. Further on in the same testimony, and also in answer to *Q.* 13, Mr. Melzer quotes another letter from Mr. Macdonald dated Sept. 19, 1894, in which Mr. Macdonald says:

> "I have found the best mixture to be as follows: Stearine 24 lbs. Caustic soda 40 ozs. Acetate Lead 40 ozs. Ozokerite 3 lbs."

I will ask you the same questions before asked as to the "four corners" and degree of saponification?

A. This formula also shows the "four corners" with the saponification of 53%.

Q. 13. The testimony of defendant's witnesses (Fargo, *Qs.* 22-3, and Dodge, *Qs.* 39-40) indicate that the so-called "Dodge Mixture" employed by complainant about the middle of the year 1894, consisted of (1) stearic acid, partly saponified by (2) sal soda, (3) ozokerite, and (4) lead salts. Assuming that this correctly applies to what Mr. Macdonald, on page 34 of 2d Book of Formulæ calls "Dodhe Mixt."—please state whether or not these entries indicate Mr. Macdonald's "four corners"?

A. They do.

Q. 14. Defendant's witness Mr. Melzer says that one of the changes which he made in the composition disclosed to him by Mr. Macdonald, was the substitution of aluminum or a salt thereof, in place of a lead salt. In view of your previous answer, was the use of aluminum (or a salt thereof) with a metallic soap, novel to Macdonald after October 6, 1894?

A. No, because on that date he has noted such use. Moreover, I find by reference to "Complainant's Exhibit, Macdonald Note Book March 2, 1891, to May 1, 1892," on pages 28-29 thereof, under date of April 16, 1892, reference is made to the use of aluminum salt in connection with a cylinder formula, and I also find in "Complainant's Exhibit, Macdonald Note Book Dec. 24, 1892, to Aug. 27, 1895," on page 27 thereof, under date of April 18, 1893, that there was a bi-metal soap of 42½% saponification so that Mr. Macdonald had at various times made both an aluminum bi-metal soap and a soap in which only partial saponification occurred.

Q. 15. Mr. Melzer says another change he disclosed to Mr. Macdonald was to dissolve his saponifier into a *lye,* instead of using it in dry form. What can you say as to the novelty or obviousness of this procedure in soap making at and before 1894?

A. To my personal knowledge it has been for twenty-five years a well known method in the making of soap to dissolve the alkali in water so as to make what is commonly called "lye." And from information and reading many works pertinent to the art of soap making of very much older date, such as for instance, "Muspratt's Chemistry," and others, I note it has been common practice, for many years before my familiarity with the art, thus to dissolve the alkali in water; and it would therefore seem to me to be an obvious method of procedure, and had I been experimenting on these lines at that date I should unquestionably have so dissolved the alkali.

Q. 16. Mr. Melzer has testified that in 1894 Mr. Macdonald submitted to him formulas that Macdonald had been using, in which he employed Stearine; that Mr. Macdonald also acquainted Mr. Melzer with the properties which the composition should have, among other things, that it should not be too soft, and that Mr. Melzer suggested that Stearic acid be employed instead of the Stearine. What can you say as to the novelty or obviousness of such a change in 1894?

A. The difference between "Stearine" and "Stearic Acid" is that the former contains more glycerine than the latter. Practically this is the only difference. It is well known that glycerine holds water in solution, and it is also well known that the glycerine itself, as well as the water which it holds, would tend to soften the composition. As these properties of glycerine were well known at that time to every chemist and practical chemical manufacturer, it would seem perfectly obvious to make the change suggested.

Q. 17. Have you read the Macdonald patent No. 606,725 here in suit, and do you understand the process therein set forth?

A. I have read the patent in suit, and believe I understand the process.

Q. 18. Mr. Macdonald states that in the early 90's he first conceived the broad idea of his invention, and that he experimented in perfecting the same and reducing it to practice during the succeeding years until he finally prepared and filed his application for the patent here in suit. After reading the patent in suit and the Macdonald Note Books referred to as Exhibits, what relation, in your opinion, do the entries in these Note Books bear to the process set forth in the patent?

A. I find in the various Complainant's Exhibit Note Books, that Mr. Macdonald records therein experiments as far back as 1892, wherein he compounds ingredients for the purpose of making cylinder records in such ways and in such proportions at various times as to show that he did, in the early 90's, have a general conception of the process which he claims in the patent here in suit. Amongst the very earliest of these formulas are to be found records of bi-metal soaps with varying proportions of the ingredients, formula after formula tried during the successive months and years, hundreds of experiments and formulas being made, but through them all seems to run the basic idea of the bi-metal-(stearic acid)-soap with a hydro-carbon. Mr. Macdonald from time to time changes the proportions of his ingredients and changes the form of the metal or metal salt, which he is using—that is to say, for instance, one time he will use a form of lead, and another a form of aluminum, and at still other times still other forms of aluminum salts, such as aluminum oxide, aluminum acetate, aluminum sulphate, etc.; he changes the form of hydrocarbon, and its proportions; the same changes in his saponifier; he changes the order of compounding, etc. etc. In fine, his notes show persistent efforts, through month after month for several years, of experimentation to determine the best percentage of saponification. As far back as April, 1893, we find that Mr. Macdonald made a mixture of the bi-metal (Stearic Acid)-soap, with a hydro-carbon,—using his saponifier in such proportions as to secure a 42½% saponification, and choosing caustic potash as his saponifier. Later Mr. Macdonald seems to have abandoned potash alkali and substituted soda alkali, seemingly for the purpose of making a harder soap, as for many years past, then, and many years before that, it had been well known that potash results in "soft soap" while soda produces what is known as a "hard soap." It is also to be noted that early in his experiments Mr. Macdonald turned from lead salts, or lead, and experimented with various forms of salts of aluminum, so that the Exhibit Note Books clearly show the use of every feature described and claimed in the patent in suit, which to my mind clearly evidences the fact that Mr. Macdonald did conceive and reduce to practice in the early 90's the process set forth in this patent.

Met pursuant to agreement on September 16, 1907.

Present—Mr. Massie, for complainant; Mr. Dyer, for defendant.

> Counsel for defendant objects to Q. 19 and the answer thereto as immaterial and irrelevant, and improper rebuttal testimony, and as relating, if at all, only to the subject matter of the companion suit on the Aylsworth patent in which the New Jersey Patent Company is complainant and the Columbia Phonograph Company, General, is defendant. It is true that counsel have stipulated that testimony taken in one suit may be used in the other, but the spirit of that stipulation was that only such testimony that was relevant to the suit in which it was taken might be used in the other suit only when also material and relevant in such other suit. The introduction of testimony in this case relating to the use of Carnauba wax is obviously an attempt by way of alleged rebuttal to introduce testimony which can be properly used, if at all, in the suit on the Aylsworth patent, such testimony, if permissible, should have been taken in the Aylsworth suit as a part of the defense therein, in order that complainant in that case might have the opportunity to reply thereto. The introduction of this testimony herein is manifestly improper rebuttal testimony, defendant has no opportunity of answering the same, if material, and therefore defendant gives notice of motion to expunge such testimony from this record.

Without prejudice to the foregoing objection the witness George A. Manwaring is CROSS-EXAMINED.

By Mr. DYER:

xQ. 19. As I understand your testimony, it is based entirely on the note books referred to therein?

A. Not entirely. Part of my testimony has been based upon previous knowledge of the state of the art and upon information given me as to other testimony in this case, said information having been given me by counsel for complainant.

xQ. 20. But so far as any opinions which you have expressed as to Mr. Macdonald's work in connection with blank compositions they have been based, as I understand it, on the notes which appear in these note books? *A*. Yes.

xQ. 21. It is also a fact, as I understand it, that such opinions have been based on the understanding that the abbreviation "Al" is intended to mean acetate of aluminum?

A. Not necessarily, for I find in some cases the abbreviation "Al" has been intended to mean other salts of aluminum.

xQ. 22. What other salts of aluminum are intended to be included in and by the abbreviation "al"?

A. Sulphate of aluminum and potash, and possibly oxide of aluminum. The reason why I say possibly in this connection is that the notes in some cases have been hastily written and abbreviated, and I find nothing inconsistent therein to the belief that any one of several salts of aluminum could have been and probably were used.

xQ. 23. Kindly refer to the particular note book, to the pages therein, and to the notes on which you base the assumption that the abbreviation "Al" not only refers to acetate of aluminum, but also to the other aluminum salts mentioned in your last answer?

A. Referring to note book marked "Complainant's Exhibit, Macdonald Note Book, March 2d, 1891, to May 1st, 1892," I find on page 28 thereof under date of April 16th, 1892, the following note: "Tried alum to-day in the mixture."

On the same page, page 29, reference is again made to "alum"—

(Counsel interrupts.)

xQ. 24. I am afraid my question was not understood. I am asking only as to the meaning of the specific abbreviation "Al." Please state where that particular abbreviation is used in any other sense than that which you particularly claim for it, namely, as representing acetate of aluminum.

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A. The abbreviation "Al" does not occur in the note book last referred to, the particular abbreviation used being "Alm."

Referring to note book marked "Complainant's Exhibit, Macdonald-Fargo Note Book of September-November, 1894," I find on page 34 thereof, under date of October 6th, 1894, the word "alum" used in two separate formulas on said page. I also find the same word spelled out in full in the notes explaining the method of compounding the formulas given on said page, and I find immediately following the formulas on page 34 and on page 35 of same book under date of October 9th, a formula including the symbol "al," and I find in the notes explanatory of said formula directions to "take aqua and heat and dissolve "Al" in it when luke-warm. I also find mention of the mixture acting like curdled milk, which is a property developed by alum under some circumstances. I find in numerous places thereafter in the same book the same symbol, that is, "Al" used with similar directions, and such comments as "Al small lump." I find on page 39, under date of October 20th, 1894, mention made of the mixture acting like "milk."

xQ. 25. And concerning the last note book which you have referred to, it is a fact, is it not, that the abbreviation "Al" occurs on almost every page up to page 34, where reference to alum is made, as well as on the subsequent pages of this note book where notes are made? *A.* Yes.

xQ. 26. Are you familiar with Mr. Macdonald's hand-writing? *A.* No.

xQ. 27. Does he never write to you or have you had no opportunity of seeing his handwriting?

A. I have seen his handwriting, yes, but I could not say that I could identify it, as being his.

xQ. 28. Are you able to say whether this particular note book is all in the same handwriting, that is to say, so far as the notes are concerned?

A. I should say in a general way that it appears from a superficial examination to be in one handwriting.

xQ. 29. You are not able to say, then, whether this note book is in the handwriting of Mr. Macdonald or Mr. Fargo?

A. As the book is not signed, and I do not profess to have any expert knowledge in handwriting, I do not care to express an opinion in the matter.

xQ. 30. And you are of the belief that wherever the abbreviation "Al" appears in this book it has reference to acetate of aluminum or other aluminum salts? *A.* Yes, I am.

xQ. 31. You are not able, however, to say what particular aluminum salt is always referred to?

A. I do not believe that the symbol was used with a uniform meaning, and do believe that it might have referred to any one of several salts, in many cases where a particular salt is not designated.

xQ. 32. So far as this particular note book is concerned (Macdonald-Fargo note book of September-November, 1894) why could not the abbreviation "Al" just as consistently refer to acetate of lead?

A. I do not recall any mention of acetate of lead in that particular note book, but I do find mention of alum or sulphate of aluminum in connection therewith, and I have no reason to believe, nor do I find any evidence, that it could have referred to acetate of lead.

xQ. 33. You express a positive and unqualified opinion in this respect, do you?

A. So far as this book is concerned, and according to my memory of it at the present time, I do.

xQ. 34. And you state without qualification that the abbreviation "Al" does not relate to acetate of lead?

A. I do not. My statement is not positive, but negative in character.

xQ. 35. You admit then that the abbreviation "Al" may possibly relate to acetate of lead?

A. I do not. I can express no opinion in regard to the matter other than that based upon examination of the book itself, and as stated before I do not recall any reference to acetate of lead.

xQ. 36. Does the fact that this book may be in the handwriting of Mr. Fargo in any way influence your opinion that the abbreviation "Al" refers principally to acetate of aluminum?

A. In my previous answers to questions relating to this note book I have confined my answers strictly to the limitations imposed on me in the form of the questions asked which referred strictly to this particular note book, and in this connection I have not stated it as my opinion that the abbreviation "Al" referred principally to acetate of aluminum and so far as the possibility of the note book being in the handwriting of Mr. Fargo having any effect upon my opinion expressed in regard thereto, I would say that it has not, as my opinions have been given as the result of an examination of the subject matter of the text regardless of the personality of the writer thereof.

xQ. 37. As a matter of fact, is it not your opinion that the abbreviation "Al" refers to acetate of aluminum based very largely on the alleged index of symbols which appears on page 30 of "Complainant's Exhibit Macdonald Notes December 24, 1892, to August 27, 1895?"

A. Without going into the question as to what constitutes the weight of evidence in the case, I would say that the symbol "Al" and its explanation as it appears on page 30 is part of the evidence which to my mind showed me that "Al" represented in some casees the form of aluminum salt known as acetate of aluminum.

xQ. 38. And never acetate of lead?

A. I have not stated that "Al" never refers to anything else, as I could not from the evidence given me for my examination. I have stated and here repeat that it seems to me that "Al" always means some form of aluminum salts, particularly in view of the fact that where a lead salt is meant another symbol is used.

xQ. 39. You do not then agree with the statement of Mr. Macdonald in *R-dQ.* 246 that "Al means acetate of aluminum"?

A. I do not recall anything in my previous answers in the way of a contradiction of such a statement, but rather have always insisted that "Al" might mean any one of several aluminum salts, of which acetate of aluminum might be one.

xQ. 40. It is a fact, is it not, that except for the index on page 30 occupying the first five lines thereof of "Complainant's Exhibit Macdonald Notes December 24, 1892, to August 27, 1895" the rest of that page is blank? *A.* Yes.

xQ. 41. And it is also a fact that the ink in which this index is written appears very much fresher than the ink on page 29?

A. That question calls for a conclusion and an opinion which I would not care to commit myself to, for the reason that varying qualities of ink might make an old writing seem fresh or a later writing seem old.

xQ. 42. How long has this note book been in your possession?

A. I have had it in my possession several times, though not continuously, beginning with June of this year, to date.

xQ. 43. Was this writing on page 30 in the book when it first came into your possession? *A.* Yes.

xQ. 44. It is a fact, is it not, as appears from Mr. Macdonald's answer to *R-dQ.* 246, that the abbreviation for sugar of lead was "Sl"?

A. I have no reason to doubt Mr. Macdonald in the matter.

xQ. 45. It is also a fact, is it not, that on page 32 of this note book we find the abbreviation "AL"? *A.* Yes.

xQ. 46. Do you still think that this relates to an aluminum salt?

A. I would not care to express an opinion in regard to that as the form of the abbreviation is changed so that both the A and L are in capitals, which might mean quite differently from "Al" and would be different from the view point of a chemist.

xQ. 47. You recognize the fact, do you not, that the handwriting at the top of page 32, where the abbreviation "AL" is used is different from that of the rest of the page in this note book?

> Mr. Massie—Question objected to as outside of the direct examination, and as incompetent since the witness has not undertaken to say anything as to who wrote in these note books, and has not qualified as a handwriting expert.

A. I do not care to undertake to express any opinions as to handwriting.

xQ. 48. Do you assent to the supposition that the index on page 30 of the note book of December 24, 1892, to August 27, 1895, refers to the notes, or is intended to refer or alleged to refer to the notes between pages 31 and 89 thereof inclusive, or in other words, is it your understanding that as to these notes where the abbreviation "Al" is used, that it refers to acetate of aluminum?

A. I do not find any allegations as to what the notes on page 30 refer to, or as to what pages of the note book mentioned they refer to, and I believe that the abbreviation "Al" has been loosely used to cover a class of materials known as aluminum salts, although at the time the explanations were written on page 30 the writer whomsoever he may have been, probably had in mind acetate of aluminum.

xQ. 49. In considering these notes, not only in this note book but in the others you refer to, did you take into consideration the fact that the abbreviation "Al" might refer to acetate of lead?

A. I saw no reason to believe that such was a fact, and considered the notes as referring to an aluminum salt when "Al" was used. And if any other meaning which does violence to the text should be arbitrarily attached to the symbol "Al" I find no evidence in the book itself to justify such an assumption.

xQ. 50. From these note books how early do you assert that Macdonald made compositions embodying acetate of aluminum?

A. In none of my answers do I limit "Al" to mean acetate of aluminum and only have considered it as one form of aluminum salt and answering your question in that way and with that in view I would say that the earliest reference to such a salt would seem to be that found in the book marked Macdonald Note Book March 2nd, 1891, to May 1st, 1892, on page 28 thereof, where alum is mentioned.

xQ. 51. Is it not a fact that in every case where alum is specifically mentioned in these note books, and by this I mean where it is completely identified, it is always used in connection with composition in which a lead salt is employed. If this statement is not correct please point out some instance where alum is used not in connection with a lead salt, and give the date of such experiment?

A. I find in Macdonald-Fargo note book on page 34, under date of October 6th, 1894, a formula calling for "Dodge mixture 16 parts plus alum one-quarter part." I could not say that in this formula a lead salt had been used.

I have not examined the notes in view of finding such a particular combination, and therefore could not answer until I have been given opportunity to go through them with that question in mind.

xQ. 52. Is it not a fact that the so-called Dodge mixture made use of a lead salt? *A*. I do not know.

xQ. 53. So that for the purposes of my last question you assumed that it did not have a lead salt in it?

A. I assumed that no lead salt was specifically mentioned, and do not know at the present time whether it contained any form of lead or not.

xQ. 54. Assuming that the abbreviation "Al" refers to an aluminum salt, how many experiments do you find in these books prior to January, 1895, in which acetate of lead was used?

A. I do not recall at the present time without having opportunity to refresh my memory, that acetate of lead is mentioned in the note book.

xQ. 55. If as a matter of fact the abbreviation "Al" refers to acetate of lead and not to an aluminum salt, I suppose you would change your opinion from that already expressed, wouldn't you?

A. To what opinion do you refer?

xQ. 56. I have reference to the opinion expressed by you in your direct examination as to Mr. Macdonald's contribution to this art.

A. Please refer specifically to the opinion that you have in mind as expressed by me.

xQ. 57. I have reference particularly to the statements and opinions given by you in answer to *Q*. 18. You there say: Mr. Macdonald from time to time changes the proportions of his ingredients and changes the form of the metal or metal salts which he is using—that is to say, for instance, one time he will use a form of lead, and another a form of aluminum, and still at other times other forms of aluminum salts, such as aluminum oxide, aluminum acetate, aluminum sulphate, etc., and you express this opinion: "It is also to be noted that early in his experiments Mr. Macdonald turned from lead salts or lead and experimented with various forms of salts of aluminum, so that the exhibit note books clearly show the use of every feature described and claimed in the patent in suit, which to my mind clearly evidences the fact that Mr. Macdonald did conceive and reduce to practice in the early 90's the process set forth in this patent." Now if it is a fact that wherever alum is positively identified in these note books and this is only three or four specific cases, and if the abbreviation "Al" has reference to acetate of lead would those facts in any way cause you to change the opinion to which I have above called attention?

A. My opinion would be essentially the same even though Mr. Macdonald did use in some cases acetate of lead, for alum is distinctly mentioned which is a form of aluminum salt and my opinion was expressed and is here reiterated as the result of an examination of the note books rather than an arbitrary assumption to which I would not care to accede to in the absence of any evidence within the books of such an assumption being well founded.

xQ. 58. Not even to the extent of accepting the statements of the man who wrote these notes, Mr. Fargo, who states that the abbreviation "Al" refers to acetate of lead?

A. My opinions as expressed have been based upon the note books themselves and I have no knowledge of what Mr. Fargo or others may have stated outside of the books.

xQ. 59. Not even in view of the admission by Mr. Macdonald that the abbreviation "Al" in these note books means acetate of lead and not acetate of aluminum?

A. I can only reiterate that my opinions have been based on the books and so far as the opinion is concerned in itself the mere fact of acetate of lead having been used in some cases would only confirm it as we would in that case find two forms of lead and an aluminum salt specifically mentioned in the books.

xQ. 60. Do you find any experiments mentioned in these note books from which you would conclude that acetate of lead was used; that is to say, experiments in which the abbreviation "Al" is employed?

A. I find in his books records of many experiments in which the abbreviation "Al" is used.

xQ. 61. If you were told by Mr. Fargo who wrote the note books and by Mr. Macdonald who superintended the experiments and who I presume knew something about them, that the abbreviation "Al" meant acetate of lead, you would still stick to your opinion, would you, that so far as the books themselves are concerned that abbreviation must be considered as meaning an aluminum salt?

A. So far as the books themselves are concerned they would seem upon examination to show that aluminum salts were used and described as "Al." Beyond that fact I do not care to express any opinion.

xQ. 62. That is to say, you would believe the books rather than the two men who prepared them, and this notwithstanding the fact that your assumption of the meaning of the abbreviation "Al" is based on no direct statements except the single statement on page 30 of "Complainant's Exhibit Macdonald notes December 24, 1892, to August 27, 1895," that "Al" means acetate of aluminum?

A. Your question assumes that the writers of the book referred to stated one thing in the book and something else at some subsequent time which would be a contradiction of their own written notes, and in the face of such a contradiction, if it existed, I would not care to say which is correct.

xQ. 63. But I thought that you were very insistent on the correctness of your position, which is, that the abbreviation "Al" means an aluminum salt?

A. I have been and am and my last answer was in response to your assumption which was no part of the evidence given me on which I have based my conclusions.

xQ. 64. Assuming that the abbreviation "Al" means an aluminum salt, in would appear, would it not, that a large bulk of the experiments which appear in the note books of "December 24, 1892, to August 27, 1894, and of September-November, 1894" respectively, relate to the making of compositions in which an aluminum salt was used? *A.* Correct.

xQ. 65. In fact it would appear that from September to November, 1894, Mr. Macdonald or Mr. Fargo experimented altogether with an aluminum salts and not with acetate of lead, at least, so far as the note book for those months is concerned?

A. That is probably correct, so far as I remember at present.

xQ. 66. You cannot state, however, that except for alum, which you claim is an aluminum salt, that any other aluminum salt is specifically referred to in the experiments made prior to January, 1895?

A. In the various formulas given subsequent to May 3rd, 1894, the symbol "Al" has been used after the occurrence in the book on page 30 of the explanation that "'Al' equals acetate alumina," and I have considered it a fair inference that at least some if not all of the experiments shown on the several subsequent pages recorded the fact of the use of acetate of alumina where the symbol "Al" is used.

xQ. 67. Why do you make any explanation at all as to the meaning of the abbreviation "Al"; if it relates to acetate of alumina in some of these experiments why does it not relate to all?

A. My last answer did not make any exception, but simply responded to your specific inquiry.

xQ. 68. Do you make the assertion, as a fact, based on the statements in "Macdonald's note book December 24, 1892, to August 27, 1895" that as early as May 3, 1894, Macdonald was making compositions and repeatedly made the same thereafter in which acetate of aluminum was used?

A. I do not. I only state that I find in the said note book records of such experiments having been made.

xQ. 69. Your answer to my last question would then be yes, would it not?

A. It would not be, but would be just as I have given it.

xQ. 70. You make a distinction then between the recording of an experiment and the actual carrying of that experiment into effect?

A. Not only so, but I have considered the books simply as an evidence of experiments having been made regardless as to who might have made them, and do not care to express any opinions as to such facts other than that the note books must speak for themselves.

xQ. 71. Having reference to the experiment of May 3, 1894, what does the abbreviation "Al" therein refer to?

A. Probably acetate alumina.

xQ. 72. You can't make the answer any more definite?

A. I don't care to.

xQ. 73. You think that these men who were experimenting with these compositions in making notes simply used the abbreviation "Al" to mean some aluminum salt without more positively identifying it? *A.* No.

xQ. 74. Are there any notes in any of the note books you refer to, except in three or four cases in which alum is used, in which prior to January, 1895, you can say positively, so as to be of some assistance to the Court, and without guessing at the matter, that a particular aluminum salt was used; if so, please point it out, identifying the salt and giving the date of the experiment?

A. Aside from the few exceptions you mention I would not care to assume as to which particular form of salt was used and recorded as "Al."

xQ. 75. Is it not a fact that your assumption as to the meaning of the abbreviation "Al" is based on the following considerations: First, you were told to make that assumption by complainant's counsel or Mr. Macdonald by having your attention called to Mr. Macdonald's answer to *R-dQ.* that the abbreviation "Al" meant acetate of alumina; second, that in three or four cases in these note books isolated experiments appear to have been made with alum, concerning which you have testified; third, the statement on page 30 of the note book "December 24, 1892, to August 27, 1895" that "Al" equals acetate alumina; and fourth, the reference to two experiments in which a cloudy or milky effect was noted which you seem to suppose is characteristic of alum?

A. In response to your question, part first, I would say no. In response to same question, part second, I would say that a number of experiments not necessarily "isolated" were made which recorded the use of alum. In response to your question, part third, the statement on page 30 of the note book mentioned is partly my reason for testifying as I have. In response to your question, part four, while I have specifically mentioned and called attention to two experiments in which a cloudy or milky effect was noted, if my memory serves me correctly there were four other cases where the same characteristic effect occurred which I have not assumed to be "characteristic of alum" except upon statements by chemical authorities which I have considered beyond question; and in addition I would say that there were other considerations contained within the books themselves which led me to believe the statements therein to be correct; such as for instance, mention being made of the material referred to being soluble in water, small lumps being taken, etc.

xQ. 76. Are you able to say that the same results would not have been noted if acetate of lead had been used in these particular experiments you have last referred to?

A. I had no reason to look outside of the statements within

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the books themselves as the statements therein were consistent with each other, and I would not care to say as to what would be the effect were acetate of lead used in place of alum or acetate of aluminum, but I would say that I have never heard of acetate of lead forming such a cloudy precipitate as described in the note books under such circumstances as the material therein used and described as a milky effect.

xQ. 77. Have you ever experimented with acetate of lead in connection with such compositions as are referred to in the note book?

A. I do not remember, as I have made many experiments all of which I cannot remember at the present time.

xQ. 78. You are not able to state then, but what if acetate of lead were used the effect stated in the note books would take place?

A. I would not care to express an opinion in regard to it, with my present information.

xQ. 79. Then you are not able to say that such would be the effect?

A. I would not care to express an opinion in regard to it, with my present information.

xQ. 80. I am not asking for an opinion, but for a statement of what you know. For aught that appears to the contrary if acetate of lead were used the same effects would take place as are noted in the books?

A. I have no reason to believe either that there would or that there would not, especially in view of the fact that I have never heard of the occurrence of such a precipitate being formed in the case of acetate of lead under the circumstances in which the "Al" was used.

xQ. 81. You do not know, do you, that these effects would take place with acetate of lead? *A.* I do not.

xQ. 82. And you do not know that they would not take place?

A. I do not believe that they would.

xQ. 83. If it were shown that these effects did take place with acetate of lead, would you still be of the opinion that in these particular experiments acetate of lead was not used?

A. If such were shown to be the case and there was nothing else to the contrary, it would be readily believable that acetate of lead might have been used.

Cross-examination closed.

Signature of witness and certificate of magistrate waived.

Complainant rests.

Extracts from Aylsworth Deposition in Suit of New Jersey Patent Co., General, *vs.* Columbia Phonograph Co.

xQ. 82. Are you familiar with the composition set forth in the Macdonald Patent No. 606,725 of July 5, 1898, and of Macdonald patent No. 626,709 of June 13th, 1899, which have been offered in evidence by defendant?

A. Yes, I am familiar with these patents and recognize them as the ones involved in the companion suits. I was familiar with the compositions therein disclosed a long time before the dates of the applications for those patents.

All but the word "yes" objected to as volunteered.

xQ. 83. Have you ever added carnauba wax to that Macdonald composition, with the temperature called for by the second Macdonald patent referred to, and also, with a lower temperature of about 300° F.; and if you have done so, what did you observe with regard to limpidity as compared to the limpidity of the same composition without any carnauba?

Mr. Dyer—I assume that by the expression "Macdonald composition" counsel intends to refer only to the composition of the Macdonald patents." Otherwise the expression is believed to be misnomer.

A. I have tried the experiments of adding carnauba wax to our blank composition, which is essentially the same as the composition referred to in the Macdonald patent, both heated to a temperature of about 300° and to a temperature of about 460°, and the limpidity I believe in either case will be the same. But I have not made accurate limpidity or viscousity tests on these two compositions for comparison. I have made the limpidity tests on the composition containing carnauba heated at the low temperature in comparison to the same composition plus lamp black and heated to the high temperature, and in this case the limpidity of the composition containing lamp black was just about the same as the blank composition containing no carnauba, and the composition containing carnauba and not containing lamp black and heated at the low temperature was more fluid than either of the other compositions. The presence of the lamp black reduces the limpidity to a slight extent so as to just about neutralize the increased limpidity, due to adding carnauba. * * *

ORANGE, N. J., March 5, 1907.

JONAS W. AYLSWORTH (recalled).

* * * * * * * * *

Q. 245. * * *

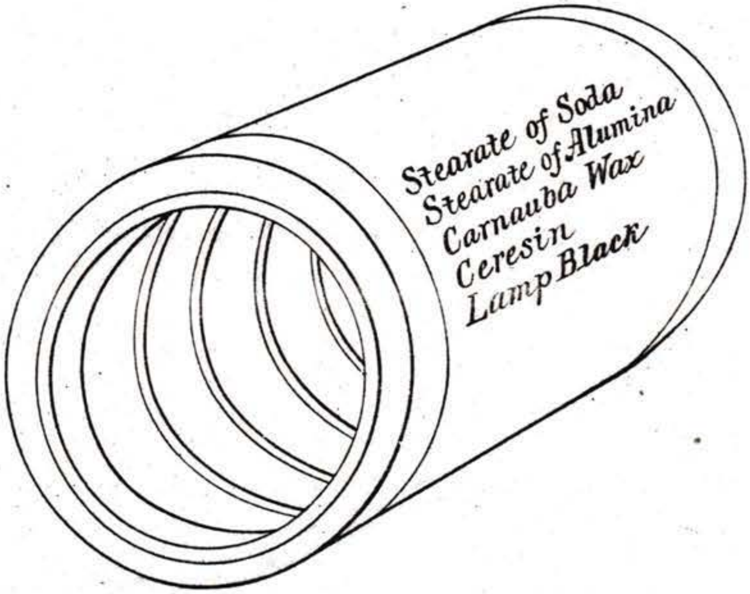
A. * * * The first reference to a metallic soap among the patents mentioned by Mr. Cameron is on patent to Edison No. 430,274 of June 17th, 1890, the application for which was filed July 30th, 1888, and suggesting preferably a lead soap. This patent was filed at the very commencement of the experimental work that developed the modern soap blank and many things had to be discovered before the bald suggestion of this patent could be turned to any possible value. It had to be discovered that the one effective stearate for use as the base of a recording composition was stearate of soda; it had to be discovered that there must be present a considerable proportion of free stearic acid, means had to be discovered for correcting the crystalline tendency of the stearate of soda, and finally means had to be discovered for overcoming the hyproscopic nature of the material. All of this succeeded the application for Edison patent No. 430,274, and even when all that work had been done, we had in the art only the present blank composition and we did not have in the art a suitable molded record composition. * * *

No. 782,375. **PATENTED FEB. 14, 1905.**

J. W. AYLSWORTH.

COMPOSITION FOR MAKING DUPLICATE PHONOGRAPH RECORDS.

APPLICATION FILED NOV. 3, 1903.



Attest:
Edgeworth Greene
Delos Holden

Inventor:
Jonas W. Aylsworth
by Frank L. Dyer
Atty.

THE ECKERT LITHOGRAPHING CO. WASHINGTON, D. C.

No. 782,375. **Patented February 14, 1905.**

UNITED STATES PATENT OFFICE.

JONAS W. AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

COMPOSITION FOR MAKING DUPLICATE PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 782,375, dated February 14, 1905.

Application filed November 3, 1903. Serial No. 179,729.

To all whom it may concern:

Be it known that I, Jonas W. Aylsworth, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain Improvements in Compositions for Making Duplicate Phonograph-Records, of which the following is a description.

My invention relates to a new composition adapted particularly for making duplicate phonograph-records obtained by any suitable process from a matrix or mold; but the composition has been gotten up especially for making duplicate phonograph-records obtained by the process described in patent to Miller and Aylsworth, No. 683,615, dated October 1, 1901, and wherein a suitable mold carrying on its bore the negative representation of the record to be duplicated is immersed in a molten wax-like coagulable material, which forms a coagulated layer of the desired thickness on the bore of the mold, after which the material is reamed out internally while warm and the resulting duplicate removed by shrinking diametrically and removing the same longitudinally from the mold, its ends being finally finished. The desirable properties or characteristics of my improved composition are such, however, that it may be effectively utilized for the manufacture of duplicate phonograph-records obtained by means of any process wherein material in a molten or plastic condition is introduced into a matrix or mold and is allowed to set or is expanded therein so as to take an impression, being removed by diametric shrinkage sufficient to clear the engaging surfaces.

A composition suitable for the purpose should have certain peculiarities, which I have been able to secure only after long experiment. In the first place, the composition should be very limpid when in a molten or plastic state, so as to flow into intimate engagement or contact with the record-surface, and thereby permit a very sharp impression to be received. It should be free of decomposition products, which would otherwise result in the generation of gas, forming bubbles, which would destroy the commercial character of the record-surface. It should be of excessively-fine texture or grain, so as not to produce extraneous sounds when the reproducer rubs over it. It should be very hard when set, so as to reduce wear as much as possible, due to the tracking of the reproducer. It should have the capacity of passing from the liquid to the solid state through an intermediate condition of gradually-reduced plasticity, to thereby enable the duplicate to shrink internally and toward the surface, so as not to clear the mold until quite hard, to thereby preserve the record, instead of chilling very rapidly at the surface to form a relatively hard film, which tends to shrink away from the mold even when the mass of the material is still molten, since I find that materials having this latter characteristic are not suitable for the purpose, owing to the danger of the record-surface being injured under the effect of the unequal chilling. It should not be sticky or tenacious, so as to adhere to the mold when set, even to the smallest extent. It should be capable of shrinking away from the mold when quite hard by a reduction in its temperature. It should have a very smooth and polished surface, so as to eliminate foreign noises due to the tracking of the reproducer. It should be free from air and gas bubbles, which if present at the surface would destroy the commercial character of any duplicates containing them. It should shrink uniformly without warping, so as to be capable of effective use with standard talking-machines. It should not be affected by moisture, so as to be preserved in damp climates, and it should have a high melting-point, so as not to soften in hot localities. When hot, it should be capable of being cleanly cut in reaming without dragging or chipping, so as to present a smooth clean surface on the bore of the duplicate. Preferably it should be of a very dark color to permit imperfections to be better observed. It should be perfectly amorphous and non-crystalline, since the latter materials harden very quickly at the surface when their congealing temperature is reached and shrink irregularly, with the objections pointed out. The composition which I have invented and which will be herein described is one possessing these characteristics, and hence is especially adapted for use in this art.

In describing my improved composition and the process which I prefer to follow in compounding the same I shall refer to preferable proportions of ingredients, to preferable steps or procedures in the process, and to preferable temperatures, all based on actual practical experience in this art; but it will be understood that in these respects considerable variations may be made, as will be obvious to those skilled in the art.

Reference is hereby made to the accompanying drawing, which shows in perspective a phonograph-record having inscribed thereon the names of ingredients which are preferably used in the preparation of my invention.

In making my improved composition I prefer to proceed, therefore, substantially as follows:

I first take one hundred pounds of commercial stearic acid, which, as is known, is generally a mixture of stearic and palmitic acids, and melt the same in a suitable galvanized-iron caldron or other vessel at a temperature of about 240° Fahrenheit. The stearic acid used melts at about 136° Fahrenheit. Care should be taken to see that the stearic acid is substantially free from oleic acid, as well as from mineral acids, salts, glycerin, and undecomposed fats, as tallow, &c. It should also be free from mucilaginous substances and hydrocarbons. When the stearic acid is fully melted, I then add to the same a water solution of carbonate of soda and aluminate of soda, obtained, preferably, in the following way: I first dissolve twenty-one and a half pounds of recrystallized sodium carbonate, in a suitable steam-jacketed caldron of about twenty gallons capacity, in ten gallons of water, and I add to the solution four hundred and fifty-two grams of caustic soda of the best grade of the commercial article. When all is dissolved, I add one hundred and seventy-five grams of metallic aluminium, preferably in the form of pieces about three inches by twelve inches square and twenty one-thousandths of an inch in thickness. When the metal is added to the solution, I turn off the heat and allow the metal to dissolve, which takes place inside of three hours. When all the metal is dissolved, the solution is filtered while still hot in a filter-press or in any other way. In adding the alkaline solution to the melted stearic acid I gradually raise the temperature of the latter so as to correspond with the increased melting-point of the mixture. The alkaline solution is added as rapidly as possible without unduly running the temperature down or causing excessive boiling or foaming. The solution can be added quite rapidly at first; but toward the end it must be added very slowly. The addition of the alkaline solution to the stearic acid results in the production of stearates and palmitates of soda and of aluminium, the latter being metallic soaps or metallic salts of fatty acids. During the saponification which thus takes place water is driven off. At the end of the operation the temperature will have gradually run up to about 360° Fahrenheit. I now add to the molten metallic-soap mixture twenty-one and thirty-six hundredths pounds of a very hard wax, preferably carnauba, the latter consisting of a mixture or combination of the higher fatty acids and alcohols. The carnauba-wax used should be as clean as possible, and it may be purified by melting the same with an equal weight of water, heating by a jet of direct steam and boiling for a short time, then drawing off or evaporating the water, after which it may be poured into pans, where it is allowed to cool into cakes suitable for weighing. When the carnauba-wax is added to the soap mixture, the temperature of the mass is raised to about 450° Fahrenheit and maintained until all foaming ceases, which usually takes about five hours. By thus subjecting the mixture to a relatively high heat a combination is effected between the alcohols of the carnauba-wax and the excessive stearic acid present in the metallic-soap composition, forming a hard wax-like compound ether, which gives to the composition many of its desirable characteristics. Unless the carnauba-wax is heated materially beyond its melting-point, resulting in the reaction referred to taking place, the composition, although harder, is very brittle and shrinks excessively and is therefore not so desirable as when the high heating is effected. Furthermore, unless this is done there is greater likelihood of decomposable products remaining in the composition, affecting the character thereof and resulting in the production of bubbles in the surface of the resulting duplicate.

After the treatment of the molten material at a high temperature has been effected and all foaming has ceased I add twenty-one and thirty-six hundredths pounds of ceresin thereto, although other hydrocarbon waxes may be employed, such as paraffin or ozocerite. The purpose of this latter ingredient is to make the mixture non-hygroscopic and also less brittle than it otherwise would be. When ceresin is used, its melting-point should be, preferably, about 145° Fahrenheit, and in any event as high as can be obtained, and it should present a fine grain on fracture and should be free from paraffin.

For the purpose of darkly coloring the composition a suitable amount of fine pure lampblack—say from .9 per cent. to three per cent. thereof—or other suitable inert finely-pulverized pigment may be added to the molten mass at any stage of the operation. Preferably, however, the coloring-matter is added together with the carnauba-wax.

After the ceresin is added and thoroughly incorporated with the mixture the congealing temperature of the latter may be regulated by adding free stearic acid thereto. In using the process described in the patent to Miller and Aylsworth, before referred to, I prefer to adjust the congealing-point of the mixture at about 290° Fahrenheit, since excellent commercial results have been secured at that temperature. I find that in dealing with temperatures above 290° Fahrenheit the addition of one per cent., by weight, of stearic acid effects a drop of about 5° Fahrenheit in the congealing-point. Obviously this regulation of the congealing-point of the mixture depends upon the special process which is to be followed in making duplicates, and where the congealing temperature is not important no attention whatever need be paid to its regulation. The material is now strained, preferably through open muslin, and is ready for use.

While I prefer in all cases to make use of caranuba-wax, as described, yet I find that beeswax and Chinese wax and palm-wax all contain alcohols somewhat similar to those of carnauba-wax and by which substantially similar reactions take place. These materials may therefore be substituted for the carnauba-wax, but always at a sacrifice in the desirable condition of the resulting products.

Having now described my invention, what I claim as new therein, and desire to secure by Letters Patent, is as follows:

1. A composition for phonograph recording-surfaces, comprising a metallic soap and a hard wax added thereto, substantially as set forth.

2. A composition for phonograph recording-surfaces, comprising a metallic soap and carnauba-wax added thereto, substantially as set forth.

3. A composition for phonograph recording-surfaces, comprising a mixture of metallic soap, a hard wax and a non-hygroscopic ingredient, substantially as set forth.

4. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, a hard wax, and ceresin, substantially as set forth.

5. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, carnauba-wax and a non-hygroscopic ingredient, substantially as set forth.

6. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, carnauba-wax and ceresin, substantially as set forth.

7. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap and a wax-like compound ether, substantially as set forth.

8. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, a wax-like compound ether, and a non-hygroscopic ingredient, substantially as set forth.

9. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, a wax-like compound ether and ceresin, substantially as set forth.

10. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, a hard wax and a black pigment, substantially as set forth.

11. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, a hard wax and lampblack, substantially as set forth.

12. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, carnauba-wax and a black pigment, substantially as set forth.

13. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, carnauba-wax and lampblack, substantially as set forth.

14. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, carnauba-wax, ceresin and a black pigment, substantially as set forth.

15. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, carnauba-wax, ceresin and lampblack, substantially as set forth.

16. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, a wax-like compound ether, and a black pigment, substantially as set forth.

17. A composition for phonograph recording-surfaces, comprising a mixture of a metallic soap, a wax-like compound ether and lampblack, substantially as set forth.

18. A composition for phonograph recording-surfaces, comprising a mixture of stearate of soda, carnauba-wax, and a non-hygroscopic ingredient, substantially as set forth.

19. A composition for phonograph recording-surfaces, comprising a mixture of stearate of soda, carnauba-wax and ceresin, substantially as set forth.

20. A composition for phonograph recording-surfaces, comprising a mixture of stearate of soda, carnauba-wax and a black pigment, substantially as set forth.

21. A composition for phonograph recording-surfaces, comprising a stearate of soda, carnauba-wax and lampblack, substantially as set forth.

22. A composition for phonograph recording-surfaces, comprising a mixture of stearate of soda, stearate of alumina, and carnauba-wax, substantially as set forth.

23. A composition for phonograph recording-surfaces, comprising a mixture of stearate of soda, stearate of alumina, carnauba-wax and lampblack, substantially as set forth.

24. A composition for phonograph recording-surfaces, comprising a mixture of stearate of soda, stearate of alumina, carnauba-wax, ceresin and lampblack, substantially as set forth.

This specification signed and witnessed this 29th day of October, 1903.

JONAS W. AYLSWORTH.

Witnesses:
FRANK L. DYER,
WILLIAM A. DOLAN.

No. 683,615. Patented Oct. 1, 1901.

W. H. MILLER & J. W. AYLSWORTH.

METHOD OF DUPLICATING PHONOGRAPHIC RECORDS.

(Application filed July 31, 1900.)

(No Model.)

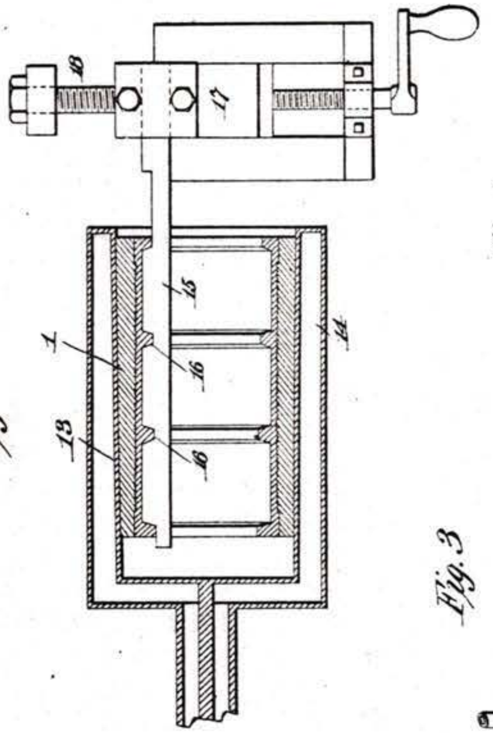


Fig. 2

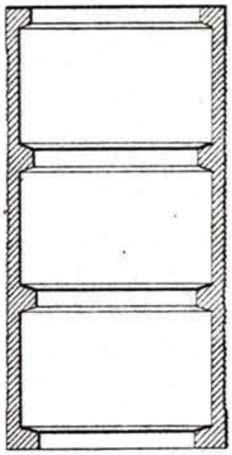


Fig. 4

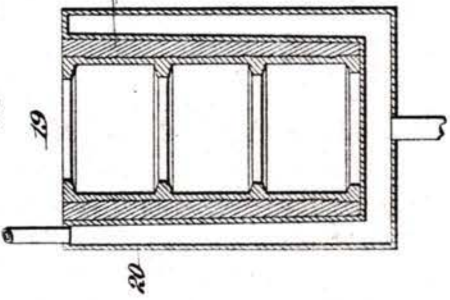


Fig. 3

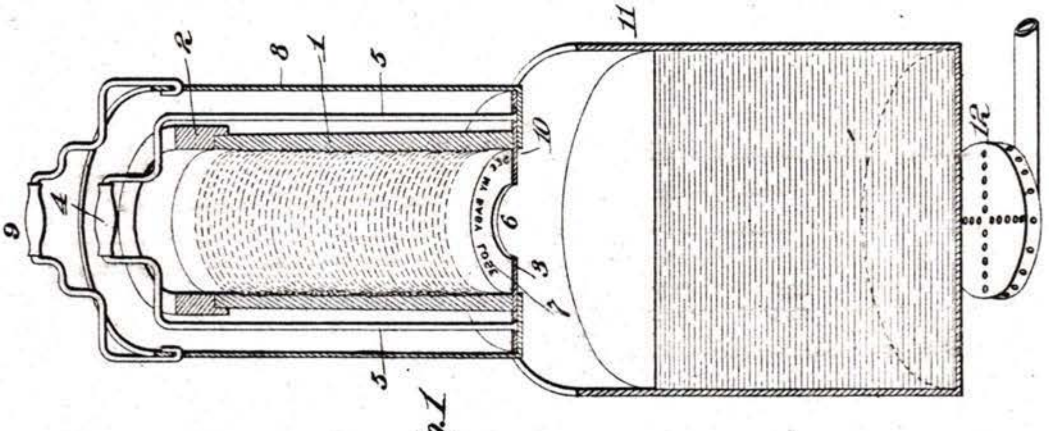


Fig. 1

Witnesses:

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UNITED STATES PATENT OFFICE.

WALTER HENRY MILLER, OF ORANGE, AND JONAS WALTER AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNORS TO NATIONAL PHONOGRAPH COMPANY OF ORANGE, NEW JERSEY.

METHOD OF DUPLICATING PHONOGRAPHIC RECORDS.

SPECIFICATION forming part of Letters Patent No. 683,615, dated October 1, 1901.

Application filed July 31, 1900. Serial No. 25,391. (No specimens.)

To all whom it may concern:

Be it known that we, WALTER HENRY MILLER, of Orange, and JONAS WALTER AYLSWORTH, of East Orange, in the county of Essex and State of New Jersey, citizens of the United States, have invented a certain new and useful Method of Duplicating Phonographic Records, of which the following is a description.

Our invention relates to an improved process of duplicating phonographic records; and our object is to provide a process by which the duplicating of phonographic records can be carried on expeditiously and economically and duplicate records produced which are of superior quality.

In carrying our invention into effect we first secure a matrix or mold from which copies are to be produced, said matrix or mold being made by any suitable and approved process—as, for instance, by a process of electroplating on a vacuous deposit preliminarily secured upon an original phonographic cylinder, the electroplating being suitably backed up and strengthened by a metal jacket and the original cylinder being removed from the electroplated coating in any suitable way, as by melting the record or by contracting it by cold. The resulting matrix will obviously be a cylinder carrying on its bore a representation in negative or relief of the original record. From the matrix or mold secured in this or in any other approved way we make duplicates by a process of immersion or dipping of the matrix or mold in a bath of molten wax-like material from which the duplicates are to be secured, whereby a coating or covering of such material will be deposited upon the interior of the matrix or mold by reason of the lower temperature of the matrix or mold. After thus securing a sufficiently thick coating of material on the interior of the matrix or mold we remove the latter from the bath, carrying the deposited material with it, and we properly finish the duplicate so secured by reaming its interior to gage, trimming one of its ends, and afterward shrinking the duplicate from the matrix or mold.

In carrying out our improved process we may utilize any suitable apparatus for the purpose, and the apparatus illustrated in the accompanying drawings, which form a part of this specification, is merely an illustrative one and we do not wish to be limited thereto.

In the drawings, Figure 1 is a sectional view of the apparatus and mold in which the deposit or coating of the wax-like material is secured; Fig. 2, a corresponding view of the apparatus for properly reaming the interior of the duplicates; Fig. 3, a similar view of the apparatus employed for the shrinking of the duplicates from the matrix or mold, and Fig. 4 an enlarged corresponding view of one of the resulting duplicates.

In all of the above views corresponding parts are represented by the same numerals of reference.

1 represents a matrix or mold carrying on its bore the representation of the record which is to be duplicated, said representation being obviously in negative or relief. This matrix or mold is made by any approved process and is not a part of our invention.

2 is a metal cap which is removably fitted upon the upper end of the matrix or mold, with its bore corresponding in diameter with the bore of the matrix or mold.

3 is a metal disk provided with a handle 4, connected to side bars 5 5 and by which the disk may be manipulated. The matrix or mold 1 is carried by the disk 3, as shown. An opening 6 in the disk 3 is of considerably less diameter than the bore of the matrix or mold, and around said opening 6 and within the bore of the matrix or mold the disk may be formed in negative with a representation 7 of suitable words or characters to indicate the subject-matter of the duplicated record, its source of origin, &c.

8 is a sheet-metal receptacle provided with a handle 9 and which carries the disk 3 and the matrix or mold 1, as shown. The receptacle 8 is provided with an opening 10 therein, which may be of the same or of larger size than the opening 6 in the disk 3.

11 represents a tank which contains, as indicated, a proper supply of suitable wax-like material from which the duplicates are to be made and which material may be the

ordinary commercial phonographic compositions now in use. The material in the tank 11 may be kept in a molten condition by heat applied in any suitable way, as by means of a gas-burner 12.

In carrrying out our process with the apparatus so far described we place the matrix or mold on the disk 3 and insert the latter, carrying the matrix or mold in the receptacle 8, as shown, after which the receptacle 8 is immersed in the molten material within the tank 11, which is permitted to enter the matrix or mold to a point above the upper end of the latter, but below the top of the cap 2, so that the material fills the interior of the matrix or mold, but does not overflow the same. The matrix or mold is thus kept immersed in the molten material for the desired time required to secure a deposit of the wax-like material of the required thickness. With the ordinary commercial phonographic composition now used maintained at from 20° to 40° above its melting-point and with a matrix or mold having a thickness of about one-fourth of an inch a deposit of material will be formed on the interior of the matrix or mold of the desired thickness after an immersion of about three minutes. Obviously, however, this time will vary with the peculiar conditions under which the process may be carried out; but in no instance should the matrix or mold be immersed within the molten material for a long enough time to allow its temperature to be raised sufficiently to permit the deposited molten material thereon to become remelted. The reduced temperature of the matrix or mold relative to the temperature of the molten material causes the latter to become coagulated or chilled on the interior of the matrix and to deposit thereon to the thickness desired. This chilling also makes the outer surface of the resulting duplicates much smoother than is the case with duplicates made by a mechanical duplicating process. Owing to the thinness of the walls of the receptacle 8 the metal thereof very quickly attains the temperature of the molten material, so that none of the molten material will accumulate thereon. It will be understood that the matrix or mold may be made of increased thickness or be artificially cooled before the dipping operation when the composition is of a character requiring an increased cooling effect to secure the desired thickness of deposit. When the desired deposit of molten material is secured, the receptacle 8 is removed from the bath of molten material and the disk 3, carrying the mold, is removed from said receptacle. Obviously the lower edge of the resulting duplicate will be perfectly true, being formed by the portion of the disk 3 between the opening 6 and the bore of the matrix or mold, and if a representation 7 is formed on that portion of the disk such representation will be cast in the bottom end of the duplicate. The cap 2 is now removed from the matrix or mold and the upper end of the duplicate is trimmed off flush with the upper surface of the matrix or mold by any desired form of cutting-tool. The matrix or mold, which has a slightly-tapered outer surface, is now placed in a tapered chuck 13, as shown in Fig. 2, which chuck is provided with a water-jacket 14, through which cold water may circulate in order that the matrix or mold may be kept cold enough to maintain the resulting duplicate or at least the outer surface thereof in a chilled and hardened condition. The chuck 13 being rotated in any suitable way, a reaming-tool 15, held at an angle to give the desired taper to the bore of the duplicate, is introduced within the same, and by reason of the cut-away portions 16 in said reaming-tool a series of ribs will be formed on the duplicate, as shown in Fig. 4, by which the latter will be properly held upon the mandrel of the reproducing-phonograph in the usual way. The reaming-tool 15 is carried by the usual slide-head 17 of the lathe, and the depth of cut of said tool is limited by a regulating-screw 18, as shown. This reaming of the interior of the duplicate is preferably carried on before the resulting duplicate has cooled sufficiently to become hard and before it has contracted from the bore of the matrix, whereby the reaming operation can be carried on effectively and smoothly. After the interior of the duplicate has been properly reamed, as explained, the matrix or mold is removed from the chuck 13 and inserted in a cooling-mold 19, having a water-jacket 20 and through which cold water may circulate, the matrix or mold being kept in the cooling-mold until the resulting duplicate has contracted sufficiently to enable it to be removed from the matrix or mold, whereupon the operation will be completed. By reaming the interior of the resulting duplicates, as explained, to form a series of ribs therein the duplicates may be made much thinner than the ordinary original records, and hence more economically, it being of course understood that the material removed by the reaming-tool will be used for the manufacture of subsequent duplicates.

While our improved process is particularly adapted for the manufacture of duplicate records, it will be understood that the process may be carried out in connection with the manufacture of phonograph-blanks by employing a matrix or mold having a smooth bore, in which a deposit may accumulate by a process of immersion, as described. The deposited blank will be reamed on its interior, trimmed on its outer edge, and removed by shrinking or otherwise in exactly the same way as that described in connection with the manufacture of duplicate records. Such a process not only provides for the cheap and effective manufacture of phonograph-blanks, but by its carrying out a superior article is produced, since the record-surface of the blanks will be smooth and calendered in appearance. With such blanks therefore after having received a record in any suitable way the reproduction will be smoother and freer of extraneous sounds than reproductions obtained from records made on other blanks.

We do not claim herein the apparatus above described for carrying our invention into effect, since such apparatus is made the subject of our companion application filed on even date herewith and numbered serially 25,392.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is as follows:

1. The method of making a cylindrical phonographic surface, which consists in immersing a continuous tubular mold in a molten wax-like coagulable material, whereby the material will accumulate on the bore of the mold and will chill thereon in a layer of the desired thickness, then in contracting the deposited material, and finally in removing it longitudinally from the mold, substantially as set forth.

2. The method of duplicating phonographic records, which consists in immersing a continuous cylindrical mold or matrix carrying the record in relief on its bore in a molten wax-like coagulable material, whereby the material will accumulate on the bore of the matrix or mold and chill thereon in a layer of the desired thickness, then in contracting the deposited material, and finally in removing it by a direct longitudinal movement from the matrix or mold, substantially as set forth.

3. The method of duplicating phonographic records, which consists in immersing a mold or matrix carrying the record in relief on its bore in a molten wax-like coagulable material, whereby the material will accumulate on the bore of the matrix or mold and chill thereon in a layer of the desired thickness, in finishing the bore of the duplicate so secured, and in separating the duplicate from the matrix or mold, substantially as set forth.

4. The method of duplicating phonographic records, which consists in immersing a mold or matrix carrying the record in relief on its bore in a molten wax-like coagulable material, whereby the material will accumulate on the bore of the matrix or mold and chill thereon in a layer of the desired thickness, in finishing the bore of the duplicate so secured, and in shrinking the duplicate from the matrix or mold, substantially as set forth.

5. The method of duplicating phonographic records, which consists in immersing a mold or matrix carrying the record in relief on its bore in a molten wax-like coagulable material, whereby the material will accumulate on the bore of the matrix or mold and chill thereon in a layer of the desired thickness, in finishing the bore of the duplicate so secured before the latter has become hard, and in separating the duplicate from the matrix or mold, substantially as set forth.

6. The method of duplicating phonographic records, which consists in immersing a matrix or mold carrying the record in relief on its bore in a molten wax-like coagulable material which is excluded from the exterior of the matrix or mold and only enters the bore thereof, whereby the reduced temperature of the matrix or mold causes the material to chill on the bore and accumulate in a layer of the desired thickness, in removing the matrix or mold from the molten material, in trimming the bore of the duplicate so secured, and in separating the duplicate from the matrix or mold, substantially as set forth.

7. The method of duplicating phonographic records, which consists in immersing a matrix or mold carrying the record in relief on its bore in a molten wax-like coagulable material which is excluded from the exterior of the matrix or mold and only enters the bore thereof, whereby the reduced temperature of the matrix or mold causes the material to chill on the bore and accumulate in a layer of the desired thickness, in removing the matrix or mold from the molten material, then in maintaining the reduced temperature of the matrix or mold while the interior of the duplicate is finished, and finally in further reducing the temperature of the matrix or mold to cause the resulting duplicate to be contracted, whereby it may be removed by a direct longitudinal movement, substantially as set forth.

This specification signed and witnessed this 17th day of July, 1900.

WALTER HENRY MILLER.
JONAS WALTER AYLSWORTH.

Witnesses:
J. L. EVANS,
HENRY WACHENFELD.